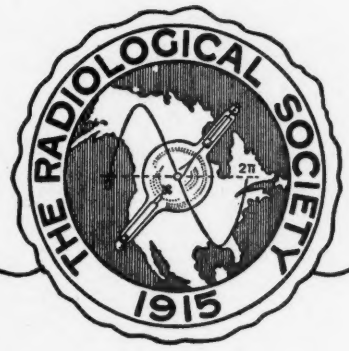
RADIOLOGY

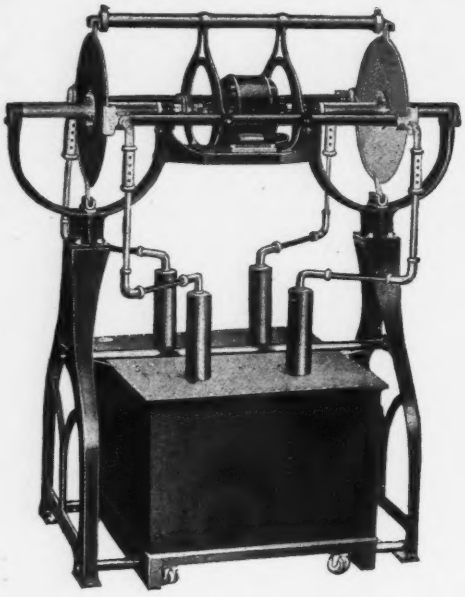
A MONTHLY JOURNAL DEVOTED TO CLINICAL RADIOLOGY AND ALLIED SCIENCES

Owned and Published by
THE RADIOLOGICAL SOCIETY
OF NORTH AMERICA
As its Official Journal



JULY, 1925

Vol. V Number 1



Triplex X-Ray Power Plant.

Radiography—Fluoroscopy—Therapy.

Limited Outputs for Safety in Therapy and Fluoroscopy.

Heavy Outputs for Water-Cooled Tubes.

Ample Output for Radiography.

Ionized Commutation.

Split Rectification.

Surge Arrestors.

Quiet Operation.

Built for Continuous Duty.

For information on this, or any type of X-Ray Equipment, write—

STANDARD X-RAY COMPANY

1932 N. BURLING STREET CHICAGO, ILLINOIS

New Water Cooling Devices.

Tilting Tube Holder.

For X-Ray Therapy with Safety.

Tube and Connections Enclosed in Grounded Metal Shield.

Full Quarter Inch Lead Protection.

Perfectly Balanced.

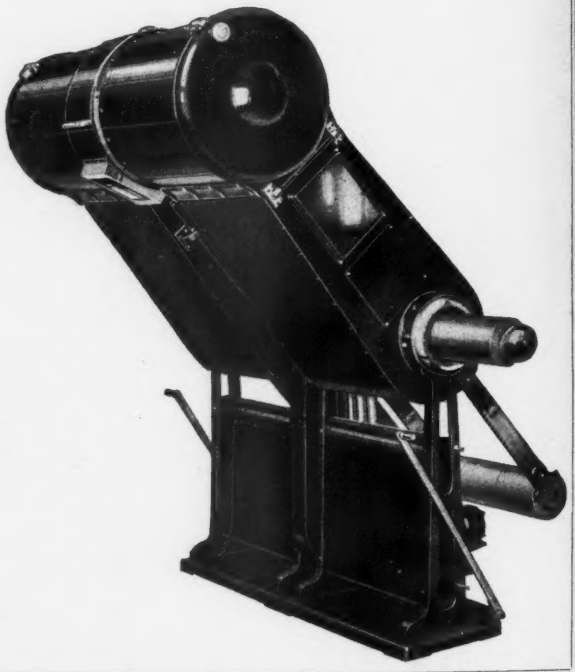
Adjustable to Any Angle.

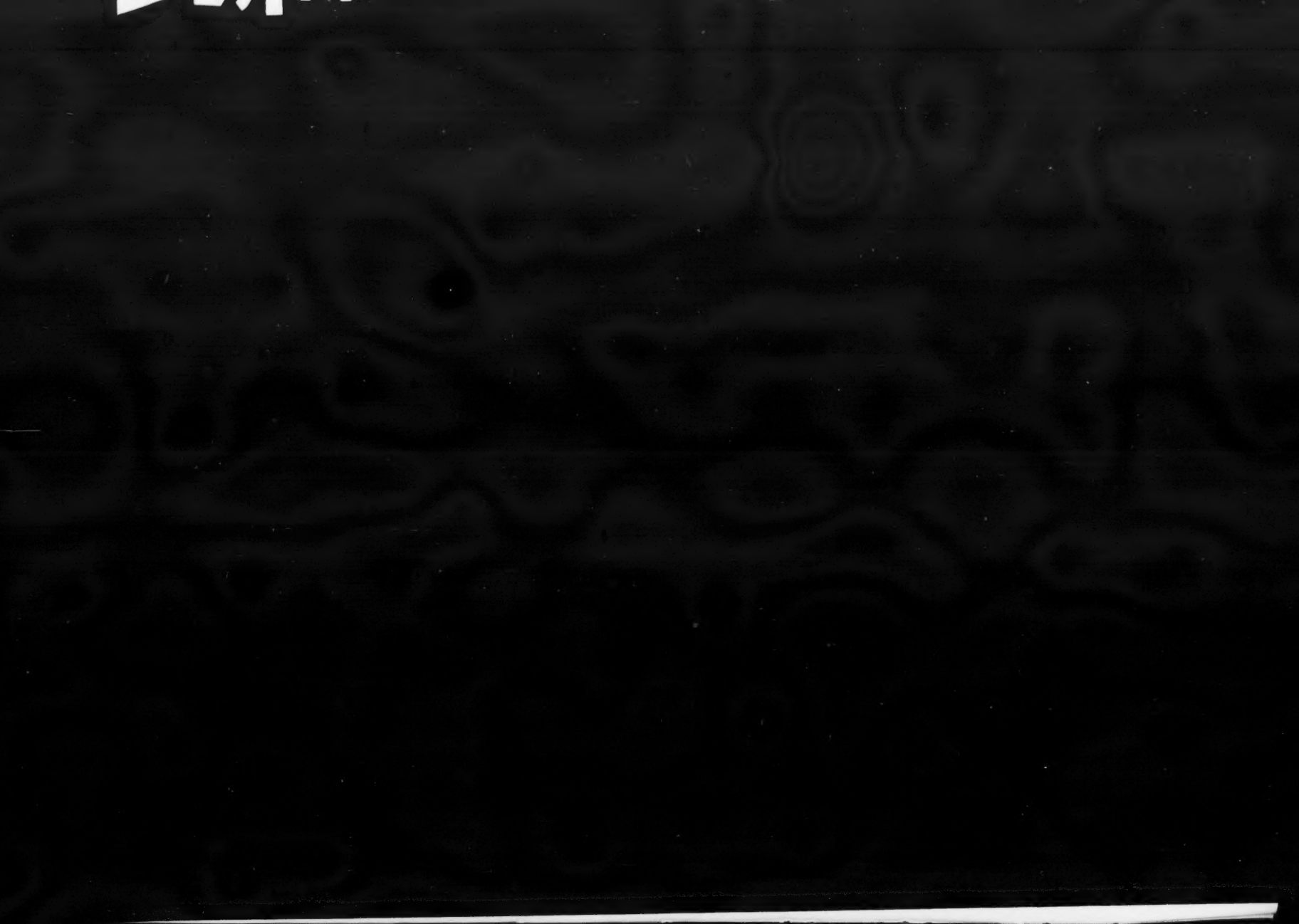
Instantly Locked in Position.

Safety Filter Lock, Making It Impossible to Treat Without Filter.

Blower for Tube Cooling and Room Ventilation.

Lead Glass Window for Seeing Tube in Operation.





RADIOLOGY

A MONTHLY JOURNAL DEVOTED TO CLINICAL RADIOLOGY AND ALLIED SCIENCES

PUBLISHED BY THE RADIOLOGICAL SOCIETY OF NORTH AMERICA

VOL. V JULY, 1925 No. 1

A BRIEF REVIEW OF THE INDICATIONS AND TECHNICAL PROCEDURES EMPLOYED BY THE AUTHORS IN TREATMENT OF CANCERS OF THE UTERINE CERVIX AND BODY[1]

By CURTIS F. BURNAM, M.D., and WILLIAM NEILL, JR., M.D., BALTIMORE, MARYLAND

WHEN Dr. Desjardins, leader of this Conference, honored us with an invitation to join in this symposium, he suggested that in the interest of clearness the discussion be limited to answering certain questions which present themselves again and again in consideration of the treatment of uterine cancer. His questions were under seven headings, and were as follows:

1. What is your position as regards surgery or radiation or both,
   (*a*) In cancer of the body of the uterus in early, border-line and advanced cases?
   (*b*) In cancer of the cervix of the uterus in early, border-line and advanced cases?
2. In those cases in which you consider surgery preferable, what type of surgical intervention do you advocate, and why?
3. In those cases in which you consider radiation indicated, what form of radiation, and in what dosage do you consider best to employ it?
4. Do you advocate the combination of surgery and radiation? If so, what are your ideas as to the best way to combine the two agencies?
5. Do you favor pre-operative radiation? If so, what do you consider adequate dosage and what method of application do you advise?
6. What interval do you consider necessary between radiation and operation and what precautions, if any, are necessary?
7. In the case of post-operative radiation, how do you feel that it should be carried out, and why?

A few preliminary statements in regard to the views we accept as to the occurrence, rate of growth, clinical diagnosis, morphology, operation and radiation possibilities, seem necessary to adequately answer the questions propounded.

Cervical and body cancers are both diseases of the uterus, but as they so differ from every standpoint it will be necessary to speak of them separately. In the early stage, bloody discharge, which characterizes both, is about the sole resemblance. Either may occur from the teens to extreme old age, but are more common in the fourth and fifth decades. The vast majority of cervical cancers are epitheliomas, the adenocarcinomas numerically constituting an insignificant minority. Exactly the reverse is true in cancer of the body of the uterus.

In considering treatment of uterine cancer with radium, it should be clearly decided upon in the beginning whether we are to strive for a cure or simply palliation. The former should be the aim in all early cases, while in the advanced, palliation should be the aim, and is helpful in controlling hemorrhage, alleviating pain and pro-

[1] Read before the Radiological Society of North America, at Kansas City, December, 1924.

longing life. The quantity of radiation necessary to destroy a cervical or body cancer is several times the erythema dose and this cannot be applied to large volumes of the body without producing irreparable injury. Our problem in radiation is to treat so that the cancer receives a large dose and the body tissue itself correspondingly little. This is ideally met in epitheliomas limited to the cervix where radium is applied directly to the lesion.

Our routine in both cervix and body cancers is to take tissue for microscopical diagnosis, and we feel that radical treatment, whether surgical or radiation, should not be undertaken without this confirmation. There is not the slightest evidence that there is dissemination of the growth through taking tissue.

In all adenocarcinomas a careful general physical examination is imperative, giving especial attention to the lungs, bones and liver. In cervical cancers most valuable data are always secured by a routine examination of the bladder and rectum. Rectal bimanual palpation is indispensable in determining the extent of the disease.

Returning now to the questions we were asked, we will first take up cancer of the body of the uterus. We divide this into three groups, *i.e., early*, or that in which the uterus is normal size or slightly enlarged, with no evidence of metastasis; *border-line*, where the uterus is definitely enlarged with possible lateral thickening, without fixation; *advanced*, where the body of the uterus is a fixed mass in the pelvis and metastasis is evident.

In the early cases of this group we advise abdominal hysterectomy unless there is considerable vaginal relaxation, when vaginal hysterectomy, especially in older patients, is advisable. An exception should be made when the patient is old or suffering from some organic disease, making the operation and anesthesia dangerous. In such a patient intra-uterine radiation up to two and a half gram hours, treating the entire uterine cavity, is a curative procedure, especially when the disease is limited to the endometrium. For this we use radium emanation, screened with two millimeters of brass and a coating of beeswax, and give the entire treatment at a single sitting. If after two months there is still discharge, the patient should be examined with the curet, and, if disease is found, re-treated with about one-half the original intra-uterine dose. The treatment can frequently be given without anesthesia and is usually finished within from one to two hours. There is rarely any constitutional disturbance. The patient, however, should be observed in bed for several days.

In the border-line cases of this group we strongly advise abdominal hysterectomy; efficient radium application is difficult to estimate and on account of the size of the uterus the mechanical difficulties of a vaginal hysterectomy are often marked. When operation is contra-indicated for any reason, intra-uterine radiation of three or more gram hours, combined with external through-and-through treatment, is indicated, and in a number of cases has yielded great improvement in the patient's health, and both bleeding and discharge usually cease. These patients may after such treatment live for years in comfort. Rarely can one expect a disappearance of the mass, although it is not uncommon to find no evidence of growth by diagnostic curettage after the treatment. I might say that in neither this group nor the one first described is there any effect from the treatment which makes operation (should it for any reason be decided on later) more difficult. Quite to the contrary, the patients are usually in better general health, and with less massive local disease.

In the advanced cases of this group, treatment should be palliative only. Intra-uterine treatment, from a gram to two gram hours, combined with moderate external radiation, is given. No attempt is made to radiate organ metastases in other parts of the body unless they are so located as to cause pain. By this method hemorrhage can be controlled, pain alleviated and life prolonged.

We have no technic which adds to the likelihood of cure as a preliminary to hysterectomy and therefore do not advise pre-operative radiation. Post-operative radiation is of value: first, by direct treatment of the vaginal vault four weeks after operation, using a flat radium applicator arranged so as to give one gram hour directly to each three square inches of vaginal wall. This takes care of the frequent local recurrent implantations; second, by cross-firing through narrow portals over the iliac glands. When crossfire radiation is employed as a prophylactic, the two sides should be done separately at intervals of a month. The future must disclose the value of this procedure; it has theoretical promise but no demonstrated worth as yet.

Let us now consider cancer of the cervix. This we divide also into three groups, *i.e., early*, or where the growth is limited to the cervix itself; *border-line* (*a*) where the growth involves the vaginal wall or parametria, but is freely movable on bimanual palpation, (*b*) where the growth has extended to the parametrium on one or both sides and is slightly fixed; *advanced*, where there is huge parametrial fixation or general metastasis.

In the early cases the line of procedure is less clear than in the early body cancers. It would seem that almost, if not quite, as many patients are curable by radiation as by operation. It is not clear what advantage combination of the two methods gives. It is logical to combine them and best as pre-operative radiation, and except for the fact that we do have some recurrences locally in previously healed, radiated cervices, the operation would be discontinued. The operation is fraught with considerable danger and is not to be dissociated from morbidity and an immediate mortality. In early cases, however, if only good operative risks are included, the primary death rate should be small. Patients presenting any of the serious organic complications should be radiated and not operated on.

In employing radium as a preliminary to operation we give one gram hour in the cervical canal with tubes in tandem, from os to os, and one gram hour covering the entire cervix. The best time to operate is within a week of the treatment, preferably the very next day. There is then no increase in technical difficulties. On the other hand, if the time of the operation is delayed more than one week, we find a definite sclerosis of the tissues, making dissection much more difficult. The operation is best by the abdominal route. At the time of operation a great deal may be accomplished by the judicious implantation of radium emanation points, if glands are found involved. We have done but few of these cases and as yet have little or no statistical datum to report. We do not believe in post-operative radiation with radium in these cases except when vaginal or local pelvic recurrence has taken place. The same statement as already made regarding the radiation of the iliac gland regions in connection with cancer of the body of the uterus applies here. It is worth trying, if done carefully, but is certainly still an experimental procedure.

In the border-line cases in Group *a* it is probable that there will be a more general combination of surgery and radiation than in the early cases. The same principles apply as were stated in the paragraph above. It is even more urgent in these cases to be ready to meet emergency at the time of operation by the implantation of emanation. Where the vaginal wall is extensively involved we give with a flat applicator one gram for thirty minutes to each square inch of surface, applying the radium direct, filtered with one millimeter of brass and two of rubber. In neither the very early nor border-line cases do we advise implantation of the parametria *per vaginum*. Where radium alone is used we give three and a half gram hours in a single treatment applied so that the cervical canal receives one gram hour and the surfaces of the cervix and vaginal fornices receive two and one-half gram hours. As a rule the treatment is given without anesthesia with the patient in the knee-chest posture, which permits of accurate placement of the appli-

cators and the interposition of thick lead and gauze screens between the radium and the vaginal walls. As a rule the growth entirely disappears locally. We prefer the single dose to the broken dose, as it seems to us to give equally little upset, admits of much more accurate placement, and takes less radiation, *i.e.*, the broken dose method requires one and a half times the amount of a single dose treatment. We see our patients, if they live nearby, each week; otherwise, not for a month or more. A second treatment is not to be considered under eight weeks, and only then if there is a definite new development beyond the site of the original disease. In such cases we use vaginal implantation of emanation, as will be described in the next paragraph. If no anesthesia is used, it is as a rule unnecessary to keep the patients in bed and they are sent out of the hospital on completion of the treatment. The results in this group of cases are so good that it is a great question whether operation should be combined with radiation, or whether it should be reserved, after definite extension beyond operable limits has taken place, to facilitate implantation.

In the border-line cases belonging to Group *b*, operation (unless as an exploratory incision to facilitate implantation) is not to be considered. The treatment by radiation is advised as in the former group, but, in addition, a strong emanation point is implanted centrally into the involved parametrium. Great care must be taken in sterilizing the vaginal wall; the needle should be introduced into the mass under guidance by a finger in the rectum, and immediately after the ejection of the emanation point, withdrawn. Large parametrial masses quite untreatable by any other method that we have tried have cleared up, and there is not undue danger of injury to neighboring organs.

As stated, the wide portal X-ray radiation has not added to our results and we are of the opinion that it has no proper place in the treatment of these cases, except as a palliative for the more advanced types.

We feel that it is almost impossible to lay down in a paper rules for covering the radiation treatment of all the different extensions of cervical cancer. A very distinguished recent visitor told us that he employed a fixed technic in all cases, whether early or late, and that he did not intend to change, as he felt his results were satisfactory. We feel that each case has to be studied separately and that immensely greater treatment must be given the advanced cases, where cure is aimed at, than the early ones.

We are confident that we are obtaining a higher percentage of cures in the early cases than were obtained a decade ago, and are pushing forward the limits of curability in the more advanced cases which formerly we only palliated. In other words, the treatment of cancer of the cervix must not be considered a closed book, but as a vital and constantly developing field for further progress.

Brain tumors.—Roentgen therapy of intracranial tumors should not be undertaken blindly, but should wait upon as accurate localizing and pathologic diagnosis as it is possible to make, even though operation may be necessary to establish it.

Roentgen therapy offers little hope of amelioration in cases of meningioma, acoustic neuroma, and tumors of Rathke's pouch. Pituitary adenomas respond well but this treatment is not altogether without danger and the visual fields should be carefully watched. Tumors of the brain substance, usually called "gliomata," sometimes are very much improved by roentgen therapy and sometimes do not respond at all. Every such tumor should be subjected to treatment (after an attempt has been made to remove it, where this attempt is thought advisable), and often good results may be obtained in apparently hopeless cases.

J. D. CAMP, M.D.

The Results of Roentgen Therapy on Brain Tumors. Percival Bailey. Am. Jour. Roentgenol. and Rad. Ther., Jan., 1925, p. 48.

IRRADIATION IN CANCER OF THE CERVIX [1]

By FRED. J. TAUSSIG, M.D., St. Louis

THE views expressed in this paper are based on observations made since November 4, 1917, in 263 cases of cancer of the cervix of the uterus or its recurrence where radium was used alone or in conjunction with surgery or X-ray. Cancer of the uterine body, of the vagina, urethra and vulva, treated with radium, are not included. Of these 263 cases, about 20 per cent were my private patients and the remainder in great part from the services of Dr. Gellhorn and myself at the Barnard Free Skin and Cancer Hospital. The character of material, especially that coming to the clinic, was very unpromising. In less than one-quarter of the cases was the disease either operable or border-line. The bulk of the patients showed extension either far out into the parametrium or down the vaginal walls. This, together with the fact that a considerable number had been tinkered with by other doctors before they came to us, must serve to account for the relatively low percentage of permanent cures obtained.

Out of a total of 100 cancers of the cervix treated from 1917 to 1920, four and one-half years ago, there are alive and clinically cured at the present time eight patients, making 8 per cent of cures. Taking only the 20 private patients the results are better; we find 4 cures, or 20 per cent. In 11 cases the patients were lost track of, but these were, of course, included among the dead.

The radium used in these treatments was usually in the form of radium element (150 mgrs.), but in a certain number emanations were employed, especially in 1917-1918, when we obtained emanations for a time through the generosity of the General Memorial Hospital of New York. Since 1922 we have used in addition deep X-ray, both in private work and at the Barnard Hospital in co-operation with Dr. E. C. Ernst.

Total dosage. The dosage given depended not so much upon the size of the lesion as on the general condition of the patient. Early cases were given a maximum dose. In 1918 we made the mistake of giving only 2,200 mgrs. to an early case, where operation was contra-indicated, obtaining what proved to be only a temporary cure. Early cancer of the cervix differs from early cancer of the lip in that the lymphatic extensions are not superficial and accessible but deep and inaccessible to any but a powerful treatment. Hence we must, so to speak, over-treat these patients to be sure that our destructive effect goes well out into the parametrium. The average total dosage I am now employing is from 4,000 to 4,500 mgrs., at least two-thirds of which is beta radiation with needles or bare silver tubes. This would be approximately the same as the 6,500 mgrs. gamma radiation employed by Heymann of Stockholm and others.

Division of dosage. We have found that

TABLE I

Cases treated from 1917 to 1920, inclusive

			Dead	Untraced	Clinically Cured	% of Cures	
Cancer of the cervix....	100	Private 20	16	0	4	20%	8%
Recurrences	12	Clinical 80	68	8	4	5%	
			9	3	0	0%	
Total	112		93	11	8	7%	

[1]Read before the Radiological Society of North America, at Kansas City, December, 1924.

whenever we transgressed from our rule of giving the total dosage within a period of six weeks' time, our final results were poorer and our complications more numerous. In recent years we have given from 3,000 to 3,300 in our first treatment, followed by a second dose of 1,500 to 1,800 four weeks later. In a short series we tried giving larger amounts, up to 4,000 mgrs. on the first treatment, but lost several of these women from hemorrhage and toxemia. Hence we abandoned this method. In fact, when the patient was weak or had nephritis or diabetes we preferred to give only 2,000 at the onset and repeat the same dose four weeks later.

Method of application. With the patient in the dorsal position with hips elevated we have inserted 50 mgrs. in silver into the cervical canal near the internal os, 25 mgrs. in silver just beneath it, and a further 75 mgrs. in the form of seven needles encircling the tumor mass. Where the cervix was inaccessible or it was desired specially to protect the rectum from radiation effects, we placed the patient in the knee-chest position for the application. Special lead filters protecting the rectum have been given up since our treatment has been largely intra-cervical and not repeated after the first six weeks. This application has usually been made under twilight sleep or nitrous oxide anesthesia.

Complications. With increasing experience we have learned to limit complications such as sepsis, hemorrhage and fistulæ to a relatively small number. One patient died of peritonitis seven days after radium application because of a tight vaginal tamponade that opened up a small septic pocket in the parametrium. A week or two of bedrest in cases running a temperature is, therefore, a wise precaution. Hemorrhage will occur after treatment in advanced cases, especially if large cautery dosage is employed. Usually these hemorrhages can be controlled by a firm pack, but in four of our patients, two of them living in the country, death resulted directly as a result of the blood-loss. Fistulæ have been reduced to a minimum in three ways: (1) by avoiding repeated doses at long intervals; (2) by applying the radium intra-cervically instead of intra-vaginally as far as possible; (3) by limiting the amount of radiation in advanced cases with involvement of vaginal walls. Occasionally in desperate cases it is better to have a fistula than to give an inadequate treatment, for a fistula may heal but a recurrent cancer spells death. This is well illustrated by the following interesting case.

Mrs. H., 39 years old, had a border-line cancer of the cervix. On March 25, 1918, she was subjected to an exploratory laparotomy. A hysterectomy was attempted but the uterine body tore off on traction from the cancerous cervix owing to extensive involvement. That evening 75 mgrs. radium was applied for twenty hours through the cervix from below. After a second similar treatment given two months later intestinal and urinary fistulæ developed. The patient was bed-ridden for six months and, according to her husband, also a physician, was nearly moribund. The next year she gradually grew better. Five years later, in 1923, she still had a fistula which communicated from the vagina into the bladder, the transverse colon and a loop of the ileum. In the past year, without operation, all but the fistula into the transverse colon was closed, and this is now so small that only when her bowels are very loose does a small quantity of feces and a little gas escape from the vagina. The bladder is entirely healed. Examination two weeks ago, six and a half years since the last radiation, showed no evidence of malignancy.

Treatment of post-operative recurrences. Permanent cures of recurrent nodules in the vaginal vault are extremely rare. In general, they run the same malignant course as carcinoma of the vagina. We have treated 24 such cases. Twelve of these, treated from 1917 to 1920, are all dead or untraced. I have seen no 5-year cures. Recently I have used radium

emanations in this type of case with satisfactory immediate results.

Pre-operative radiation. After several unpleasant experiences in which I proceeded to a hysterectomy from two to twelve days after giving a radium treatment, I am convinced that this is inadvisable. The difficulties of exposing ureters in tissues that are soft and hyperemic are considerable. The venous oozing conceals the operative field and the increased friability interferes with a clear dissection and proper clamping off of the vagina. I have, therefore, preferred to wait four or five weeks after radium application before performing the hysterectomy. The danger of sepsis and implantation metastases is greatly lessened at this time. On the other hand, I would advise caution in doing a hysterectomy upon a border-line case that shows complete retrogression after radium. The mobility of the uterus at this time may give a wrong impression as to the difficulties to be encountered. One may be surprised in such cases to find a ureter imbedded in scar tissue. Hence it is dangerous to do a hysterectomy unless one has examined the patient before radium was applied and has definite knowledge as to the involvement at that time. A pre-operative dose in these early cases should, in my opinion, be not less than 2,500 to 3,000 mgrs., enough to produce complete retrogression. Ordinarily in very early operable cases limited to a small segment of the cervix I prefer to use the direct cautery or nothing at all before hysterectomy.

Post-operative radiation. About three weeks after a hysterectomy we have usually made an application of 100 mgrs. of radium in silver, brass and rubber in the vaginal vault for from 15 to 18 hours. This application has not been made stronger or repeated, because of the greater sensitiveness of the vagina to radiation and the reports of Weibel concerning fistulæ where larger doses were given. Prophylactic treatment with deep X-ray has also been resorted to. Reports are rather conflicting as to the value of these measures, but *a priori* I think that with the new X-ray machines we may expect better permanent results.

Glandular metastases. In a relatively large number of patients there were metastases in the iliac glands without any recurrence in the uterus, vagina or parametrium. I have no accurate data for comparison, but it has seemed to me that these distant glandular metastases have occurred more frequently since I have plunged needles into the cervix at the time of the primary treatment. Bailey had a similar experience with the use of emanations in vulvar carcinoma and advised gamma radiation previous to the implantation of the emanation spicules. The direct traumatism involved in the use of needles or emanations may be a source of more distant implantation of tumor particles and if these tumor particles have not previously been devitalized we are in danger of producing metastases. With this in mind I have in the past month begun to have my cervix cancers treated primarily with a series of X-ray treatments totalling 850 milliampere minutes by Dr. Ernst, followed in two weeks by a radium application with needles and tubes—unfiltered—amounting to 3,500 mgrs. I think that the final results with these patients will be better than in the past.

The treatment of glandular metastases has been accomplished by a laparotomy and direct implantation of 1 millicurie emanation spicules into the gland, the dosage depending on the size and number of the glands involved in the case. There were no immediate complications from this method of treatment. Sufficient time has not elapsed to determine the final results, but our experience with other forms of recurrence would lead us to believe them to be only palliative.

Comparison with European clinics. When we contrast the final 5-year results obtained in American clinics with those abroad, it would seem at first that our technic was distinctly inferior. Thus we find that Bailey reports 10 per cent of cures in

242 cases (only 5.5 per cent for the first three years); Greenough in his survey for the American College of Surgeons gives 11 per cent of cures in 829 cases; my own figures were 8 per cent in 100 cases. From abroad we have the reports of Beuttner of 17 per cent in 63 cases, Heymann showing 20 per cent in 217 cases, and a tabulation of 1,100 European cases with 20 per cent of cures, made by me in 1921. In some of the German clinics the greater percentage of cures may be explained as due to the greater percentage of early cases treated, but in the long series reported by Heymann from Stockholm, Sweden, it would seem that the percentage of early cases was about as low as in our clinics. Here we must seek other factors. Dr. Vincent, head of the Rockefeller Foundation, in a recent address in St. Louis, speaking of the low death-rate in these Scandinavian countries, touched upon two points that, I believe, may also throw light upon this striking difference in our final radium results. One is that in countries like Sweden the mass of the people carry out the instructions of their medical advisors (*all cases* traced for 5 years or more) and the other is that the average practitioner of medicine is more intelligent and conscientious than in this country. In this country, said Dr. Vincent, each individual has an opinion of his own on medical matters, whether he knows anything about it or not; and anyone can be a doctor of some sort or other. This lack of co-operation on the part of patient and practitioner is of vital consequence in the final results obtained by the radiologist. The intervals between treatments are often prolonged by the procrastination of the patients. Even more serious is the tendency for the general practitioner, who usually is first to see the cases, to do some tinkering such as a curettage, an attempt at hysterectomy or an inadequate radium treatment, with the result that the opportunity of a permanent cure is thereby lost. It is our duty to impress upon the mass of the profession this danger of tinkering with cervical cancer.

Finally, we must ever bear in mind that with radium as with operation it is important to get the cases as early as possible and that no material progress can be made without an increase in the percentage of early cases treated. This can come only as the result of a persistent year-in-and-year-out campaign for early recognition of the disease.

Calculi in lower half of ureter.—The writers would call attention once more to a method of which they have made use during the last one and one-half years and which they believe should be used more often in cases of calculi lying in the lower half of the ureter. This method consists simply in passing a catheter beyond the stone and allowing it to remain there for from two to five days. This procedure may result in the passage of the calculus within a few hours after the withdrawal of the catheter.

The mechanism is not clear. Perhaps the edema of the mucous membrane which holds the stone is allowed to subside; perhaps some traction on and dislocation of the stone are caused by withdrawal of the catheter; perhaps dilatation of the ureter is the chief factor. Whatever the mechanism, it has two great advantages over other methods in this category: (1) a single treatment frequently suffices to deliver the stone, and (2) stones are passed with very little pain.

W. W. Wasson, M.D.

Use of Indwelling Catheter to Induce Passage of Ureteral Stones. Edwin Beer and Leo J. Hahn. Jour. A. M. A., April 4, 1925, p. 1028.

ETIOLOGY, PATHOLOGY, AND TREATMENT OF CANCER OF THE CERVIX[1]

By DANIEL T. QUIGLEY, M.D., OMAHA, NEBRASKA

IT is common knowledge that cancer may be the result of long-continued irritation; it is also well known that this irritation may be of various kinds. The kinds of irritation that are definitely known to precede cancer in a sufficiently large number of cases as to leave no doubt as to etiological relationship, may be put in four classes:

1. Mechanical irritation; this may be illustrated by the smoker's pipe.

2. Chemical irritation; this may be illustrated by physiological acid, as in the stomach, or pathological acid, as in acid mouth, and chemical poisons, such as nicotine and tar from tobacco smoke.

3. Thermal and actinic—heat and cold; this may be illustrated by burns, scalds, and frost bites. Light rays belong in this class, as they are simply vibrations of a different wave length.

4. Infection. Every case of cancer is preceded by infection. The first three kinds of irritation probably act mainly by opening up areas to infection and keeping them open. The first three irritating agents may be considered as predisposing causes and infection the immediate cause of cancer. Cancer may occur without trauma, or chemical or thermal irritation, but it never occurs without infection. As an illustration of this point we have cancer of the body of the uterus which grows on a basis of chronic endometritis. It is not likely that cancer is due to any specific organism, but that many different kinds of organisms and many different combinations of organisms gain access to the tissues, and, remaining a sufficiently long time, may produce the chemical substances that develop a stimulating effect on cells leading to proliferation. The fact that cancer grows in many and various places in the animal and in all animals seems to render it highly improbable that it is due to any one specific organism, but that any chronic infection by any organism or combination of organisms may lead to cancer, the specific element in cancer-production evidently being the elaboration of any toxic substance capable of seriously injuring or destroying cells and the consequent calling out of Nature's defense reaction. The new cells that grow in response to this reaction being unstable and not fully matured have about the same standing biologically as injured cells and help to establish a vicious circle by exuding a growth-stimulating chemical substance, in the same manner that the injured cells in any traumatized area elaborate a growth-stimulating substance to produce new cells to heal the cut or torn area. In the healing of a relatively sterile wound the irritating agent is soon removed and the new cells produced are normal, healthy, functioning cells. In the case of a wound that heals by granulation the irritating agent is slowly removed, but it is removed, and Nature is permitted to finish the job of making mature, complete cells. In the case that goes on to cancer-formation the irritating elements are not removed, a long-drawn-out battle results, the new cells produced are not mature, finished cells. They are immature, poisoned, injured cells, weeping from their cell walls the same growth-stimulating substance that is produced by any injured cells, and an autonomous newgrowth results.

Cancer is but one of the end-results of chronic infection. Chronic infection may terminate in other ways.

The human animal is more subject to cancer than are the other animals because the human animal carries around more chronic infections than the other animals do. A wound that might be very serious in a man would heal in a few days in a dog. A wound that might heal very slowly in a savage or a dog might fail to heal in a

[1] Read before the Radiological Society of North America, at Kansas City, December, 1924.

civilized man or woman, becoming a chronic ulcer or infected area leading eventually, possibly, to cancer. It is a well-known fact that domestic animals have more cancers than wild animals of the same species, and the animals that come nearest to the modes of living of civilized man have the largest percentage of cancers. There is something in the life of civilized man which lets down the bars against infection and lessens the power of the animal to fight against it when once it has become established. These life-reducing elements are probably the living in dirty, dusty, dark, germ-infested houses, instead of in the clean fresh air and sunshine; the lack of vitamin and mineral balance in food; the failure to observe personal cleanliness, clean skin and clean mouth; the failure to keep metabolism up by proper exercise; the failure to excrete poisons from the body and the deliberate taking of poisons into the body, such as tobacco and alcohol. All these things lower bodily resistance and cause the so-called civilized individual to carry around local infections which in the lower animal or the savage would heal. Cancer then involves a general disturbance as well as a local disturbance, but the general disturbance is only a let-down in the infection-fighting mechanism of the human animal.

Cancer of the cervix is a disease of child-bearing women, a result of the torn cervix. A small tear will heal with a good scar and no danger of cancer; a larger tear may eventually lead to a chronic ulcer and chronic endocervicitis in a civilized woman, while a tear of the same size would quickly heal, with a sound, healthy scar, in an animal or a savage woman. Another element entering into the question is the elasticity of the tissues, which is greater in the savage or the animal and thereby protects them against the tears of greater degree which could not be expected to heal spontaneously. In the etiology of cancer of the cervix there are several physiological and anatomical facts that must be considered.

1. The vaginal canal and the vaginal portion of the cervix are covered with squamous epithelium, while the cervical canal and inside of the uterus are covered with gland epithelium.

2. The chemical reaction in the vagina is acid; in the uterus it is alkaline.

3. The vaginal canal contains a very great number of various kinds of micro-organisms. The inside of the uterus in a normal woman is sterile. As long as these relations are not disturbed, or not disturbed to any great degree, no trouble results, but when the cervix sustains such a tear as to evert a certain amount of the cervical mucous membrane into the vaginal canal then the stage is set for the train of events which may eventually lead to cancer. The cells of the cervix normally living in a field which is alkaline and sterile are thrown into a field where the reaction is acid and infected. These cells cannot survive under the changed conditions. They die, an ulcer is produced, and a certain amount of scar tissue is formed. The os being destroyed, infection now ascends into the cervix and body of the uterus; a mucopurulent discharge results, which pours over the injured cervix, supplying further irritation. The epithelium from the vaginal and uterine sides both grow in to fill the defect, with the result that the squamous cells sometimes cover gland cells, causing cysts of the cervix. There is more vitality in the squamous epithelium than in the gland epithelium so that when the overgrowth of epithelium, which we call cancer, finally occurs, it is usually of the squamous type. Many of these cancers show a mixed type; a few show the glandular type. The usual cervix cancer being of the squamous type, the disease remains localized for a relatively long period of time, just as lip cancer and esophageal cancer and other forms of squamous-cell cancer remain localized for a relatively long time. When, however, the cancer growth penetrates into the cervical canal, then it invades an area where mucous membrane is laid directly on muscle, and once the mucous membrane is gone through and cancer plugs invade the uterine

muscle, particles are likely to be broken off and float as emboli in the lymph vessels or be carried to the lymph glands. Lymph supply is very rich in the region of the cervix and upper vagina and very poor in the body of the uterus. In the body of the uterus the mucous membrane is not laid directly on muscle, but between the two structures we find a loose connective tissue. This protects the uterine muscle against invasion, while the scarcity of lymph vessels makes it difficult for particles to be carried away, even though the muscle be invaded.

The anatomical, physiological, histological and pathological considerations indicate that cancer of the body of the uterus is a very favorable subject for cure by surgical operation, and this conclusion is borne out by experimental evidence, most surgeons reporting 85 per cent to 95 per cent cures in this disease. The same considerations indicate that cancer of the cervix is a bad field for surgical operation, the percentage of cures being small and the immediate mortality from the operation being high. In America, Taylor states that "the percentage of cures following hysterectomy is distinctly under 10 per cent; the immediate mortality from the operation is around 20 per cent." It is doubtful whether operation for cancer of the cervix, unaccompanied by radiation treatment, is ever justified. In our own work it has been difficult to get early cases, as our work has been practically all referred for radiation treatment on account of being inoperable and presumably incurable. In these cases we have a small percentage of cures. Two of the patients who were so cachectic as to be unable to walk are now apparently perfectly well, attending work on their farm homes in western states. One of these women has gone over eight years and the other over ten years since treatment. The pathology in both of these cases was a very considerable local growth, without involvement of glands. Both women were over 60 years of age. At such an age the lymph vessels are not active and very large local growth may occur without gland involvement.

Our conclusions in regard to advanced cases are that a few such may get well. The radiation treatment is used mainly as a palliative measure, as all cases receive benefits in the controlling of bleeding, discharge, odor and the prolongation of life. Many such cases heal locally and never recur in the pelvis, the distant metastasis eventually causing death. On account of removing disagreeable symptoms the treatment of these cases becomes a great comfort to the family as well as the patient. Radium is combined with X-ray; surgery or cautery are never indicated in these cases, as these measures involve a general anesthetic and this destroys the patient's resistance against the disease. Any remaining malignant masses or cells always grow faster after a general anesthetic.

The so-called border-line cases are those in which the disease is supposed to be more than local yet does not involve neighboring glands. Induration which may be felt in the broad ligaments on one or both sides is usually supposed to be cancer, but it is usually not cancer, at least not solid cancer. The masses that first appear on the sides of the cervix are areas of round-cell infiltration and edema sprinkled usually more or less with cancer emboli. In some few cases cancer emboli are absent, the whole mass being a low grade inflammatory process, which clears up easily and quickly with radium and X-ray treatment. This has led to many false reports of cures and led surgeons to attempt many unjustified operations. The surgeon in this case says, "The treatment has brought the case back from an inoperable condition to an operable condition." The deduction is wrong, because these cases almost invariably recur. The reason for recurrence is that the mass which has been composed of 99 per cent inflammatory mass and 1 per cent cancer emboli has been reduced as to the 99 per cent, but the 1 per cent still remains and the cancer emboli, which might remain latent for years if let alone, are stirred to

activity by the subsequent surgical operation.

Our results in these border-line cases are but little better than in advanced cases, recurrence usually taking place in the glands.

We have been taught that cancer is a solid mass of proliferating new cells and that it may jump from a primary to a secondary location, giving no thought apparently to the fact that the pathway between the two areas is necessarily a contaminated, infected, potentially cancerous field, and the diameter of the cancer should be considered the distance from the primary cancer to the most distant infected gland or lymph vessel. We may consider the growth of cancer in three stages:

1. The diseased area is local, simply a mass of growing cells set in an area of low grade inflammation. The disease is a solid mass.

2. The lymph vessels in the neighborhood contain products of inflammation and cancer cells. The disease is no longer simply a solid mass. It is a solid mass of cancer cells surrounded by tissues containing lymph vessels in which there is a fluid containing detached cancer cells. It may now be considered a solid mass of cancer surrounded by a liquid zone of cancer.

3. The micro-organisms from the diseased area filter into the first line of glands and are destroyed. The cancer cells filter into the same glands and are destroyed. The micro-organisms come in larger and larger numbers, the gland hypertrophies; eventually the function of the gland is lost. Cancer cells float in, the diseased gland can no longer destroy them; secondary cancer is formed. Our cancer area is now a solid cancer mass surrounded by liquid cancer in which are to be found solid cancer islands like the original cancer mass. In the advanced case and the so-called border-line case, with more or less induration around the uterus, the enveloping zone of induration may consist of:

1. Round-cell infiltration.

2. Round-cell infiltration more or less mixed with cancer.

3. Mainly cancer.

In the first class cure may be effected by radium and X-ray treatment, which cures a local cancer with an inflammatory zone around it. The second class is incurable by any treatment except in cases where the cancer cells exist as detached floating emboli or are particularly sensitive to radiation, which happens occasionally in the glandular type of cancer. In some locations the sensitiveness almost approaches that of sarcoma. The third class is incurable and may or may not be improved symptomatically by combined radium and X-ray treatment.

The main interest to the physician of cancer of the uterus is in the early case, as with improvement in the education of the profession and the laity on this subject we will see more early cases.

In our work we have endeavored to collect a number of early cases and to determine whether or not they might be healed for a sufficient number of years so that the word "cure" might be applied to them. If the early case can be cured, then a great step in advance has been made in the treatment of this disease which kills from fifteen to eighteen thousand women in this country every year, as with the ability to cure the early case education would be the only thing necessary to cut down the mortality. Our early cases are of the type that would be considered as operable by the average careful European surgeon, which is quite different from the case considered operable by the average American surgeon. The Americans operate on many cases which would be rejected as inoperable in Europe. In our early work eleven years ago we accepted no early case for treatment except in patients who refused operation. At the present time we accept all cases for radium treatment and only occasionally recommend operation.

Our cases of this early localized type number 69 in the period from 1914 to 1921. Of this number we have traced 51 over three years, and of the traced cases we have 37 apparently cured. The other

14 have been lost or died after three years of known good health. Of these 14 we know three to be dead, one to have recurrence at present, and 10 are lost. Fifty-one well at the end of three years; 37 well between three and eight years: this leaves 18 unaccounted for who have not been traced through the first three years. Some of these are undoubtedly dead, but some are probably well. Applying the same percentage that we find to be true in the traced cases, it would give us a percentage over the whole group of 66⅔. Or if we count only the cases known to have survived, somewhere between three and eight years, and assume that all the others ultimately developed recurrence, then our percentage of over-three-year cures would amount to 53.6. Of our cured cases one dates to 1916, three to 1917, two to 1918, five to 1919, seven to 1920 and nineteen to 1921.

In dealing with the question of cancer of the cervix we should go back to the most probable cause, the torn cervix, and consider treatment from that point. The torn cervix should be immediately repaired. If immediate repair is not done then the repair should be done within a few months, before ulceration and deep-seated infection become established. If ulcer of a chronic benign type exists it should be considered pre-cancerous and the cervix should be amputated. If proliferation of tissue has started, as evinced by a hardened edge of newgrowth with a tendency to bleed, then radium should be used locally followed by operation or not according to the needs of the individual case and the judgment of the medical adviser.

In the border-line and advanced cases radium should be used for intensive local effect and X-ray for extensive effect.

In our records we have 11 apparently cured cases of post-operative recurrence which have survived the three-year period. Five cases in 1921, one in 1920, one in 1919, three in 1917, and one in 1916. These are undoubtedly single transplants of cancer cells occurring at operation of a circumscribed and local nature so that they were completely destroyed by local application of radium.

DISCUSSION

CHAIRMAN DESJARDINS (Rochester, Minnesota): For a time this afternoon I almost thought we were attending a session of the League of Nations, but I am glad we have got down to business. In arranging this conference I tried to plan it so as to make it yield certain definite information. With this end in view I made up a list of questions and asked the different men who were invited to take part in the symposium to build their discussion of the subject around these questions. For instance, the first one was:

1. What is your position as regards surgery or radiation, or both,
   (*a*) In cancer of the body of the uterus { in early cases / in border-line cases }
   (*b*) In cancer of the cervix { in advanced cases or / inoperable cases }
2. In those cases in which you consider surgery preferable, what type of surgical intervention do you advocate, and why?
3. In those cases in which you consider radiation indicated, what form of radiation, in what dosage, and in what manner do you consider it best to employ it?
4. Do you advocate the combination of surgery and radiation? If so, what are your ideas as to the best way to so combine the two agencies?
5. Do you favor pre-operative radiation; if so, what do you consider adequate dosage, and what method of application do you advise?
6. What interval do you consider necessary between radiation and operation, and what precautions, if any, are necessary?
7. In the case of post-operative radiation, how do you feel that should be carried out, and why?

Those questions, of course, are frequently asked by clinicians, surgeons, and radi-

ologists, and it was with the hope of at least providing some material to help us answer them that they were made.

These contributions have been extremely interesting and stimulating and we must thank Dr. Neill, Dr. Quigley and Dr. Taussig for coming here to give them. I should like to allow myself a few remarks. I was particularly pleased to hear Dr. Neill state the basis of their classification of cases, which happens to correspond exactly with our own; because I feel it is extremely important to start off with some sort of classification of cases and to plan your treatment on such a classification. They in Baltimore, the same as we do, divide their cases roughly into two groups: one in which are placed the relatively early cases where there is a fair chance of accomplishing something like a permanent result; in these cases the treatment is to be given in a relatively short time and made as thorough as possible. On the other hand, the second and much larger group includes those cases in which a permanent result is out of the question and in which the problem is to alleviate symptoms to the greatest possible degree; here the treatment is arranged according to the patient's condition and repeated whenever necessary. I know that very much the same scheme is used at the Memorial Hospital in New York. Among the early cases subjected to operation after previous radiotherapy we have found a considerable group in which, in spite of making a large number of sections from each cervix, the pathologists who reviewed these specimens were unable to find any evidence of cancer cells. If Dr. MacCarty is here I believe he will verify this statement. I should not want you to understand that this is true of all cases, by any means. However, this experience has led our surgeons to show a more conservative tendency and to be more reluctant to operate in such cases. In the other group, including border-line or more advanced cases, very few operations are undertaken. I wish to bring up one more point which is that if a fairly good result in such a case has once been obtained by radiotherapy, especially if some time has elapsed since such treatment was given, it is generally bad policy to consider operation even though such operation may appear technically feasible. If operated on, some of these cases break down in most horrible fashion.

DR. NEILL: It has been the custom at our clinic not to advise operative removal after radiation. We feel, however, that this question has not been fully decided and will not be answered until it has been thoroughly investigated by surgeons and radiologists over a five-year period or longer.

DR. A. U. DESJARDINS: Being in Philadelphia some two years ago, I remember finding Dr. John G. Clark somewhat concerned about a case on which he had recently performed an operation some twelve to fourteen days following treatment by radium. Severe peritonitis had supervened and the situation looked desperate. If an operation is to be performed, I feel it should be either quite early, that is, within a week, or much later, that is, after an interval of six or eight weeks.

Dr. Neill, I was requested to ask whether you had any increase in shock following operations when the operation was done within a week?

DR. NEILL: We have not experienced in any of our cases a tendency to increase shock when operation has been done following radiation for carcinoma of the cervix. When operation is decided on, it is best to perform it the following day or at the most within forty-eight hours. Any further delay would only tend to increase the difficulties of the dissection due to the reactive features produced by the radium.

DR. HENRY SCHMITZ (Chicago): There is one question I wish to ask Dr. Quigley: Did he mean to say that women with many children have cancer of the cervix more frequently than women with fewer children?

DR. D. T. QUIGLEY (Omaha): The greater the number of children, the greater the carcinoma incidence. I wish to commend Dr. MacCarty on the classification of malignancies according to their differentiation, and when that is applied to X-ray therapy and tumors are classified in that manner, similar to the manner in which Dr. Bowing of the Mayo Clinic has classified epitheliomas, and they have been treated and will be reported under that classification, I believe that then we will be getting somewhere when we speak of X-ray statistics and percentage of cures, for then we will all be speaking the same language. I would like also to say, speaking as a pathologist, that the sections that are removed should be saved and should be preserved in suitable media, so that when statistics are reported these sections may be checked by another disinterested party, a pathologist able to interpret whether or not these conditions are malignant. One opinion very often is not conclusive. For the same reason, when we give statistics, some other individual—a disinterested party—should check them, and then I believe we will be getting somewhere in reporting cases by both X-ray and radium.

DR. HENRY SCHMITZ: In a paper presented at the American Medical Association in June, at Chicago, a special study of the incidence of the number of pregnancies in carcinoma of the cervix was reported. Four hundred consecutive cases were taken. We found that two-thirds of all the patients who had carcinoma of the cervix had three or fewer children. We then collected four hundred cases which had been admitted to the hospital without any carcinoma, but of cancer age, to see what the relation of the number of children would be in these four hundred women and we found that two-thirds of the women had three or fewer children. This demonstrated the predominance of carcinoma in women with few or no children, also the predominance of women with few children. We then came across a report of the health statistics of Budapest in which the statistics are kept separate for the Jewish and non-Jewish women. It is a fact that the Jewish women married early and had a great number of children, while the non-Jewish women usually married late and had very few children, still the relative frequency of carcinoma among the non-Jewish women compared to that among the Jewish women was as three to one. An explanation is difficult. Probably infections in the childless or one-or-two-child marriages are more frequent and probably contribute to the sterility of many of these women. Therefore the infection probably predisposes to carcinoma.

The results of ray therapy in uterine cancer in our clinic may be shown in the

FIVE-YEAR RESULTS IN CERVICAL CARCINOMATA

A. Primary Carcinomata

YEAR	Group I			Group II			Group III			Group IV			Total		
	No.	Living	Per Cent	No.	Living	Per Cent	No.	Living	Per Cent	No.	Living	Per Cent	No.	Living	Per Cent
1914	1	1	.....	1	0	.....	14	0	.....	3	0	.....	19	1	5.3
1915	.....	.....	.....	4	3	.....	10	0	.....	5	0	.....	19	3	15.7
1916	1	1	.....	2	0	.....	8	2	.....	5	0	.....	16	3	18.7
1917	.....	.....	.....	4	2	.....	10	2	.....	4	0	.....	18	4	22.1
1918	1	1	.....	4	1	.....	18	2	.....	8	0	.....	31	4	12.9
Total	3	3	100.0	15	6	40.0	60	6	10.0	25	0	.....	103	15	14.5

B. Recurrent Carcinomata

1914	1	0	.....	.....	.....	.....	3	0	.....	4	0	.....	8	.....	.....
1915	.....	.....	.....	2	.....	.....	6	0	.....	2	0	.....	10	.....	.....
1916	2	0	.....	.....	.....	.....	6	0	.....	3	0	.....	11	.....	.....
1917	1	0	.....	1	.....	.....	3	1	.....	2	0	.....	7	1	.....
1918	.....	.....	.....	1	.....	.....	6	1	.....	5	0	.....	12	1	.....
Total	4	0	.....	4	0	.....	24	2	.....	16	0	.....	48	2	4.2

accompanying tables. I wish to say that we also group our cases—we have four groups. The first group corresponds to the one Dr. Neill spoke about as the clearly localized single growth. My Group 2 corresponds to Group 2-A of Dr. Neill, and Group 3 to his Group 2. The Group 2 cases are treated with radium and X-ray. A subsequent surgical excision is performed only when the patient does not respond to the radiation treatment. The results of radiation treatment are shown in the table (page 15).

In other words, in the 103 cases we had fifteen five-year cures. The table also includes all those cases which did not return for re-examination. These have been classed as dead. In the recurrent carcinomata we treated 48 cases, with two five-year cures. I feel that these two cases are simply exceptional; in other words, the absolute curability in these 48 cases was 4.2 per cent. The surgeon who removes a uterus and is not quite sure that he has removed all the cancer tissues, should refer the patient immediately to radiation therapy.

In the next table I produce three groups of clinics: In the first three I have placed three clinics in which carcinoma of the cervix was treated only with radium; in the second three, radium and X-ray combined, and in the last three, with surgery only.

The table shows that the surgical clinics are working with very much better material than the radiation clinics. We must assume that the cases which are transferred to the radium and X-ray clinics are the worst ones, and that explains the low absolute curability. If the operability in the clinics of Clark, of Bailey and in my own and also in the other clinics were as high as in the surgical clinics, we probably would have had twice the percentage of cures.

DR. QUIGLEY (closing): I only have one point to speak of in closing, and that is in regard to the incidence of cancer in child-bearing women. We went over a great number of statistics in my work in the University of Nebraska Medical College in this connection, where we compiled reports from many leading European and American hospitals, and the conclusions were interesting. I could not take up these things in the short paper, but I have used them in teaching my classes in the university. The summing up of all the statistics we could get from hospitals in all civilized countries was that cancer incidence in married women increased exactly in accordance with the number of children born up to five children. Now the woman who has one child has more likelihood of having cancer than the woman who has no child, and the woman who has two children has more likelihood of having cancer than the woman who has none, and that increases until we get to the woman with five children, and there it stops; the average age for married women with children was 47 years.

DR. NEILL (closing): I certainly enjoyed the two papers read this afternoon and I am glad to note that Dr. Taussig agrees with so many of the points I attempted to bring out. During the discussion

PERCENTAGES OF OPERABILITY AND RELATIVE AND ABSOLUTE CURABILITY OF CERVICAL CARCINOMATA FOR DIFFERENT METHODS OF TREATMENT

Clinic	Operability Per Cent	Total Number	Number Cured	Relative Cures	Absolute Cures	Method of Treatment
Clark, J. G.	17	140	12	27.2	8.6	Radium
Bailey and Healy	22	155	17	26.4	9.2	Radium
Kehrer	45.7	129	36	40.7	27.8	Radium
Doederlein	32.6	755	103	30.3	13.2	Radium and X-rays
Baisch [1]	51.0	198	28	23.8	14.1	Radium and X-rays
Schmitz [1]	17.5	103	15	50.0	14.6	Radium and X-rays
Johns Hopkins	52.1	387	102	46.5	26.6	Surgery
Stoeckel	70.6	350	98	35.4	26.6	Surgery
Graves	64.0	181	34	34.2	18.5	Surgery

[1] Cases treated surgically are not included.

someone spoke of being guided in the methods of treatment by the statistics and descriptions of technic employed in European countries. I am quite sure that the time is past when we in America should look to Europe for leadership in this question. There are no better radiologists or surgeons anywhere in the world than in our own country. The X-ray apparatuses manufactured here far surpass in every detail those manufactured elsewhere.

DR. TAUSSIG (closing): I did not include any remarks on cancer of the body of the uterus in my paper, but I should like to express in a few words my feelings on that subject. I feel that this is a disease that is either curable by operation or is hopeless, one of the two extremes. I have tried to gain some satisfactory palliative effect by intra-uterine applications of radium in these cases, and I must say that the result has been most discouraging. I would therefore be inclined, even in a somewhat advanced case, to do an exploratory laparotomy and try, if possible, to effect a cure by operation. I believe that is the only thing that will give a chance of permanent relief.

Roentgen-ray dermatoses.—1. It is the writer's impression that roentgen-ray dermatoses in physicians and technicians are far more frequent than the literature would lead us to believe. Many cases, even severe ones, have probably never been reported.

2. In six of the cases reported, a clinical diagnosis of malignant degeneration was made, and was confirmed microscopically in three, these three being the only patients allowing microscopic examination. Two of these physicians have had a finger removed because of malignant change, and one has undergone several major operations, lost a thumb, had glands dissected out, and finally recovered through this and the use of electrocoagulation and radium.

3. A microscopic study of tissues from selected roentgen-ray dermatosis shows that it is a degenerative change resulting from sclerosis of the vessels supplying the skin: the glandular elements of the corium disappear; the corium is much thickened from the formation of a degenerated hyaline, collagenous-like material; newformed capillaries (telangiectases) attempt to replace the lost blood supply of the corium. In early stages, the epidermis is not much affected, but in older cases, the epidermis proliferates in its hunt for nourishment from the corium and sends down epidermal processes, which finally grow wild and take on a malignant change.

4. The treatment of chronic roentgen-ray and radium dermatoses consists in the use of quartz lamp therapy, carbon dioxid snow, electrocoagulation, surgery, and in some cases radium and roentgen-ray treatment. It is quite successful if not too much damage has been done and if instituted early. The best treatment, however, is prophylaxis.

5. Roentgen ray and radium, when used properly and with care, are not a danger to the patient or the operator.

6. Because of the present widespread use of fluoroscopes, radium and roentgen-ray apparatus, especially by general medical men and dentists, the writer believes that great care should be taken in protecting the operators.

7. The writer advises the adoption of the measures recommended by the Royal College of Physicians and the American Roentgen Ray Society.

W. W. WASSON, M.D.

Chronic Roentgen-ray Dermatoses as Seen in the Professional Man. H. N. Cole. Jour. A. M. A., March 21, 1925, p. 865.

MYELOID MYELOMATA[1]

By SHERWOOD MOORE, M.D., St. Louis

From the Department of Surgery, X-ray Laboratory, Washington University School of Medicine

OWING to their infrequency of occurrence, myelogenic tumors, if they can be considered tumors, are still a source of much difference of opinion as to their genesis, course and pathological features. There is some reason to believe that they vary greatly in their radiological aspects. In one respect only do they resemble each other, that is in their inevitably fatal outcome, sequential to a gradual destruction of the bone marrow, with the concomitants of anemia and asthenia.

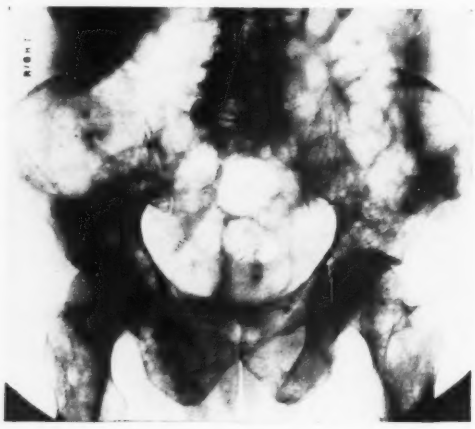


Fig. 1. Case I. Pelvis showing small circular rarefied areas. Absence of surrounding reaction.

Ewing (1) states that, "if one classifies myeloma according to the views of different observers concerning the origin of the tumor cells, the following groups appear: (1) Plasmocytoma, (2) Erythroblastoma, (3) Myelocytoma, adult and embryonal, (4) Lymphocytoma." He qualifies this by stating that it is questionable whether these various classifications actually exist or whether they are to be explained on the basis of anaplasia.

The four cases on which this report is based consist of (1) a chloroma of the myeloid type which is considered a myelocytoma, (2) one case of frank plasma-cell type of myeloma, or plasmocytoma, and (3) two others classified with the second group, but at the same time differing in several respects. In one, a complete autopsy was done, the findings of which raised the question as to whether or not it was an erythroblastoma; the other case, whilst material was secured and examined, did not permit of more definite placement.

These four cases all had fairly long observation, extensive X-ray studies; two were autopsied and in two the diagnosis was established by biopsy. An attempt was made to determine from the literature the incidence of multiple myeloma, but the attempt, proving unsatisfactory, was given up. These cases have occurred in 32,292 admissions to the Barnes Hospital and in 165,374 admissions to the Washington University Dispensary in ten years. Examples of none of them have been found in the files of the X-ray Department, which are intact from 1910 to the present. The example of plasmocytoma (Barnes Hospital M, 13,212) included is the ordinary and usual form of multiple medullary myeloma, radiographs of one or more cases of which are usually to be found in large X-ray laboratories, and reports of which are encountered from time to time in the X-ray literature. It was the characteristic plasma-cell type, presenting the customary history, symptoms and physical findings, with these exceptions, if they can be so regarded: In the chest film there was found a widening of the upper cardiac shadow which on fluoroscopy seemed to possess an expansile pulsation, and the patient did not have Bence-Jones albumosuria. The exact nature of the mediastinal shadow and pulsation could not be determined. There was no enlargement of the spleen. The

[1]Read before the Radiological Society of North America, at Kansas City, December, 1924.

blood picture remained unchanged except for a simple anemia. Radiographic examination revealed an extensive pathological process of the bones of the pelvis and thorax; those of the extremities and of the

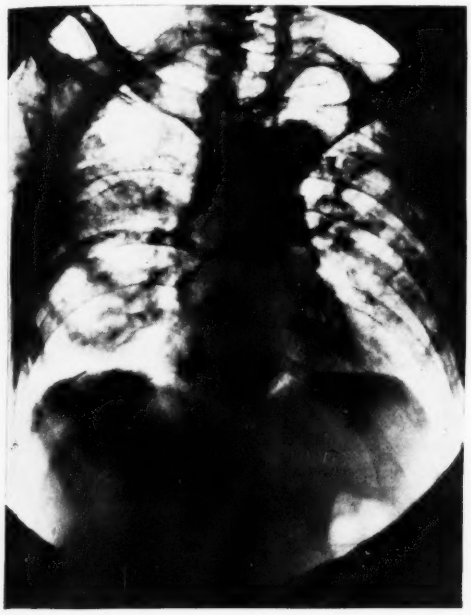


Fig. 2. Case I. Radiograph of chest. Note expansion of right sixth and ninth ribs posteriorly and eleventh left. Numerous rarefied areas in bones. Wide supracardiac shadow which pulsated under screen.

skull were uninvolved. The chief characteristic of the process, as shown by the X-ray, was the production of ovoid or rounded rarefied areas in the bones (Fig. 1). These varied in size and the larger ones gave to the affected bone the appearance of being expanded from within, a thin shell usually remaining and enclosing the softened area. On one of the ribs this shell of bone was lacking, as if the periosteum had, through pressure, finally been destroyed (Fig. 2). This seeming expansion is, of course, not actual distention of the bone but the result of internal resorption with external deposition of bone. In his article on multiple myeloma Christian (2) presents a drawing of a section of a rib well illustrating the process of expansion. The point to be borne in mind is that there are in this disease definite marrow tumors and there is no evidence radiographically or otherwise suggesting an infiltration. It is well known also that these tumors metasta-

Fig. 3. Case II. Radiograph of pelvis made February 1, 1923. Generalized even rarefaction.

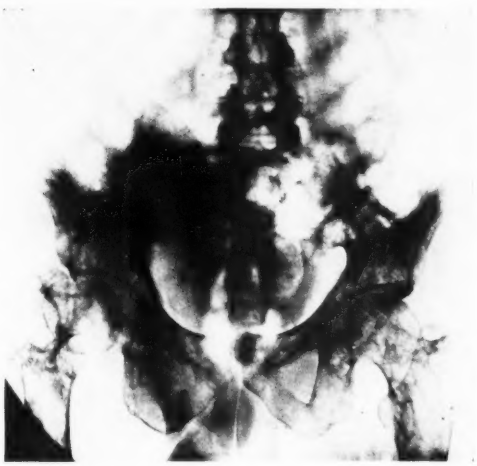


Fig. 4. Case II. Radiograph of pelvis January 24, 1924. Note change over preceding.

size or invade other tissues only exceptionally. This patient complained of much pain in the diseased bones, for which deep X-ray therapy was employed without benefit.

The second case (S, 17,018) was admitted to the Barnes Hospital January 23, 1924, remaining until May 25; a male,

Fig. 5A. Case II. Radiograph of right femur.

white, aged 27 years. This history will be gone into more fully and is taken up next, as it had some points of similarity to the preceding one. Two years before examination the patient developed pain in the back, attributed to Pott's disease, for which appropriate treatment was applied. Seven months before entry he fractured the right humerus and right femur, from trivial injury, which accidents were followed by good repair. About a month before entry he again fractured the right humerus and pelvis and was sent to another hospital. It is of interest that this patient applied for treatment at the Washington University Dispensary February 1, 1923. His pelvis was radiographed and presented what was then considered extensive bone atrophy secondary to the wearing of a plaster jacket and disuse (Fig. 3). He was referred to the Barnes Hospital for the purpose of receiving deep X-ray therapy for what was thought to be a carcinosis of the skeleton, the origin of which was unknown. Physical examination on entry showed evidence of the right femur having been fractured, also the right humerus near the shoulder. The patient was quite weak, but had no particular pain. The blood count was as follows: R.B.C. 2,960,000; W.B.C. 9,750, of which 7 per cent were myelocytes; hemoglobin 65 per cent. There were no Bence-Jones bodies at any time. The X-ray examination of the skeleton showed widespread structural changes in the bones of the extremities and the pelvis. The chest examination, aside from being negative, revealed that there was no involvement of the ribs comparable to that observed elsewhere in the skeleton. The skull was also unaffected. In the bony pelvis the changes consisted of small circular rarefied areas of sharp outline, with but little tendency to become confluent, suggesting the existence of multiple discrete small tumors (Fig. 4). In the shafts of the long bones, particularly in the femora, the cortex had a sharply marked scalloped appearance, as if resorption had taken place before an increasing pressure of a lobulated tumefaction within the marrow cavity (Figs. 5A and 5B). Externally there was no evidence of any bone being laid down nor were there any signs of an expansion of bone. The process showed a marked predilection for the long bones, where the sharp and almost

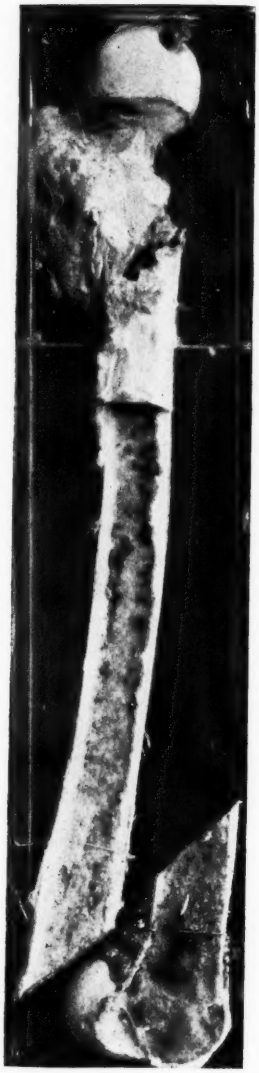


Fig. 5B. Case II. Photograph of posterior aspect of femur removed at autopsy. Marked scalloped appearance in medullary cavity in both (see Fig. 5A). This is characteristic of bone changes observed in this case. Pathological fracture.

distinctive appearance is best seen. This is in sharp contrast with Case I, though in both the changes observed in the bone suggest that they resulted from a similar mechanical agency. From admission the patient grew progressively weaker and more anemic and finally died. Throughout his stay in the hospital the white cells were

Fig. 6. Case III. Radiograph of right shoulder, February 2, 1923. Note tumefaction of clavicle at junction of outer and middle thirds. Courtesy of Dr. C. C. McClure, of Nashville, Tenn.

numerically about normal and he consistently showed from 3 to 7 per cent of myelocytes, the differential being otherwise normal. At autopsy the anatomical diagnosis was as follows:

Primary: *Multiple myeloma* of plasma-cell type of long bones, with thinning and destruction of cortex and fractures of upper thirds of left femur and humerus.

Splenomegaly with increase in fibrous tissue and infiltration with cells of plasma-cell type associated with hemorrhage. Accumulation of cells of plasma-cell type about portal areas and within sinusoids of liver. Areas of sclerosis in both kidneys infiltrated with cells of plasma-cell type and in left kidney associated with hemorrhage.

Fatty degeneration of heart, liver, kidneys. Edema of lungs and extremities. Decubital ulcers over sacrum and right knee. Emaciation. Anemia.

The histology of the bone marrow, by Dr. McJunkin of the Department of Pathology, is given in full. Although strongly suggesting an erythroblastic origin for the tumor, his final conclusion was that

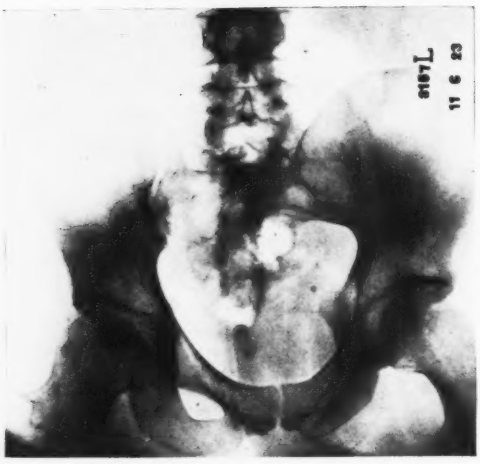


Fig. 7. Case III. Pelvis radiographed November 6, 1923, showing destructive invasive process beginning in the right side of sacrum along the iliac joint. Lent by Dr. C. C. McClure.

it was a plasma-cell type of myeloma (Figs. 16 and 17).

"*Bone marrow* removed from that present at the site of the fracture and from the foci of softening in the upper and middle thirds of shaft and extreme lower end of shaft all reveal the same picture, namely, a complete absence of bone trabeculæ and myeloblastic tissue, except at the periphery of the softened areas, where benzidine stains reveal a survival of the myeloblastic cells in their normal proportions in a very small portion of the tissue. The benzidine reaction is entirely negative in the tissue proper, as composing these softened areas. This tissue is composed of multiple dense extravasations of blood, infiltrated with small round cells and densely surrounded by the same. All of this tissue has a rather dense fibrillar stroma supporting it, in which small round cells infiltrate less abundantly between the denser foci associated with hemorrhage. The myeloblastic element of the bone marrow is completely replaced by this tissue.

"In certain areas the cells strongly resemble plasma cells as found in the usual plasma-cell type of myeloma. In other areas the appearance strongly suggests that they are erythroblastic, megaloblastic and normoblastic. Most of them, however, appear only as small lymphocytes or small round cells and those clumps of cells of definitely erythroblastic type. Red blood cells being so abundant and associated in about equal proportions with, or in many instances in great majority over, the small round cells, suggests strongly the tissue being mainly erythroblastic in nature throughout the tissue responsible for the multiple focal softening."

The next patient was referred by Dr. C. C. McClure, of Nashville, Tennessee, for deep X-ray therapy; a white male, aged 35, Barnes Hospital S, 17,040, from January 28 to September 22, 1924. History and examination briefly as follows:

Onset, with pain in ribs, February, 1922; became better with strapping. The following October fractured the right clavicle from slight violence. Immediate union. Mass formed at site of fracture, diagnosed spindle-cell sarcoma (Fig. 6). Clavicle excised February, 1923. Tumor appeared on forehead in June; disappeared under X-ray treatment. Radiation was also applied to the clavicular region. In July, pain developed about the right sacro-iliac region, referred down the sciatic nerve; a plaster cast was applied. In November, evidence of destruction in the sacrum at the sciatic notch was found on X-ray examination (Fig. 7); symptoms were amenable to X-ray therapy. Referred to the Barnes Hospital January 28, 1924, with great pain in the right lumbar region and sacro-iliac joint. Patient bedridden, incapacitated and under morphine. Examination at this time revealed nothing of importance save what was to be attributed to the destructive process in the right side of sacrum and along the sacro-iliac joint. The blood examination was as follows: R.B.C. 5,008,000; W.B.C. 7,320, of which 8 per cent were myelocytes; hemoglobin 80 per cent.

The X-ray examination revealed a pathological condition of the right side of the sacrum, upper third of the left tibia, right humerus, bones of the right ankle and foot. The right eleventh and twelfth ribs

were also affected and showed an expansion. These findings were characterized by a rarefaction and destruction of the bone; the outlines of the rarefied areas were not clear-cut and where multiple they tended to fuse. There was no indication of expansion (save as observed) of the bone nor of periosteal response (Fig. 8). It was notable at this time that the tumors of the skull which had perforated, as shown in the examination by Dr. McClure in October, had almost entirely disappeared. This is interesting as an example of the rare occurrence of *restitutio ad integrum* in the calvarium. This patient was given deep X-ray therapy over his bone lesions, with astonishing symptomatic benefit.

He re-entered the hospital during the latter part of April. He had been up on crutches, had gained much weight, and had resumed work. There was now a return of pain in the right sacro-iliac region. Again deep X-ray therapy was given. The blood examination was: R. B. C. 4,960,000; W.B.C. 14,950, of which 22 per cent were myelocytes, chiefly neutrophilic; hemoglobin 85 per cent. X-ray examination of the bone lesions showed evidence of some repair having taken place at the site of the destruction in the right side of the sacrum. There was complete relief from pain. Re-entry about two months later because of return of pain. Condition otherwise the same as at previous entry. A subcutaneous tumor nodule in the right abdominal wall was excised. The pathological report was myeloid myeloma, considered to be of plasma-cell type (Fig. 16). The blood count at this time was: R.B.C. 4,250,000; W.B.C. 6,750, and hemoglobin 60 per cent. No differential count was made. Re-entry, July 31, for additional X-ray therapy. Enlargement of the nodes on either side of the neck. X-ray therapy as before. Re-entry, September 18. A large subcutaneous mass had developed in the upper third of each thigh; another, smooth in outline, movable, painless, the size of a hen's egg and subcutaneous, appeared over the posterior aspect of the right shoulder. X-ray

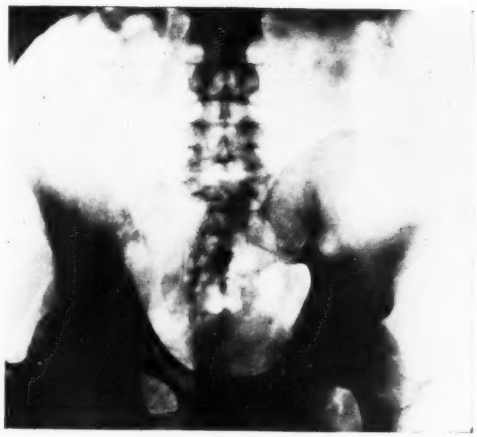


Fig. 8. Case III. Same as Figure 7, taken January 28, 1924, showing advance of process and its invasive nature as shown by its passage *across the joint.*

examination showed a great extension of the destructive process from the sacrum into the right ilium (Fig. 9). The other bone lesions were essentially stationary. There was a large indefinite mass filling the right iliac fossa, with swelling of the soft parts posteriorly as if they were all involved in a diffuse tumor mass. The patient's condition was extremely poor. He returned home and died October 20.

The fourth case, white, male, aged 29, Barnes Hospital S, 10,516, entered the hospital with the following history: Nine and a half months previously he had noticed a small swelling in the middle of his left arm, which has progressively increased in size. It had not been very painful and interfered only slightly with his work. General condition fairly satisfactory. Two days before entry he felt something "pop" in the arm, since which time it had been extremely painful. Physical examination showed fusiform swelling at mid-point of the left arm, which was tender, firm, immovable. There was a false point of movement and crepitation. The axillary glands were not enlarged. The spleen was enlarged 5 cm. below the costal margin. The blood count showed: R.B.C. 3,020,000; W.B.C. 85,100, of which 22 per cent were myelocytes, the vast majority of which were

basophilic; hemoglobin 65 per cent. The X-ray examination of the left humerus revealed an oblique fracture of the shaft at the mid-point. Radiating out from the shaft of the humerus at this point were numerous calcified arborescent strands, reaching some distance into the soft tissues

Fig. 9. Case III. Great advance in process over Figure 8, showing almost total destruction of iliac portion of innominate bone. Remainder of pelvis and femora free. No evidence of expansion.

(Figs. 10A-10C). The X-ray of the chest was negative; *there were no bone findings elsewhere.* In all other respects the examination was negative. The diagnosis was myelogenous leukemia, of which the patient had all the signs and symptoms, and periosteal sarcoma of the humerus with pathological fracture. In view of the pain and the hopelessness of its being relieved by union of the pathological fracture, the arm was disarticulated at the shoulder in spite of the presence of the leukemic picture. The pathological report of the tumor of the removed humerus was myeloma (Fig. 16). There was an uneventful recovery from the amputation and the patient was transferred to the medical service for treatment of the leukemia. Considerable benefit was derived from the administration of benzol and X-radiation, though there was a remarkable blood picture in the course of the treatment. On May 26 it presented: R.B.C. 3,920,000; W.B.C. 300,800, of which 28.4 per cent were myelocytes, al-

Fig. 10A. Case IV. Radiograph of left humerus. Note arborescent calcified material extending out into soft tissues, and pathological fracture.

most entirely neutrophilic; hemoglobin 54 per cent. In June, the R.B.C. was 3,992,000; W.B.C. 39,800, of which 14.3 per cent were myelocytes, almost entirely neutrophilic; hemoglobin 70 per cent. Patient was discharged from the hospital to continue with benzol and report from time to time for further X-ray treatment.

Re-entry October 17, 1921. Returned because of recurrence of growth in the suture line in the axilla, where there had existed a small mass at the time of his discharge. This had increased much in size and given rise to severe pain. The mass

Fig. 10B. Case IV. Lateral radiograph of amputated arm.

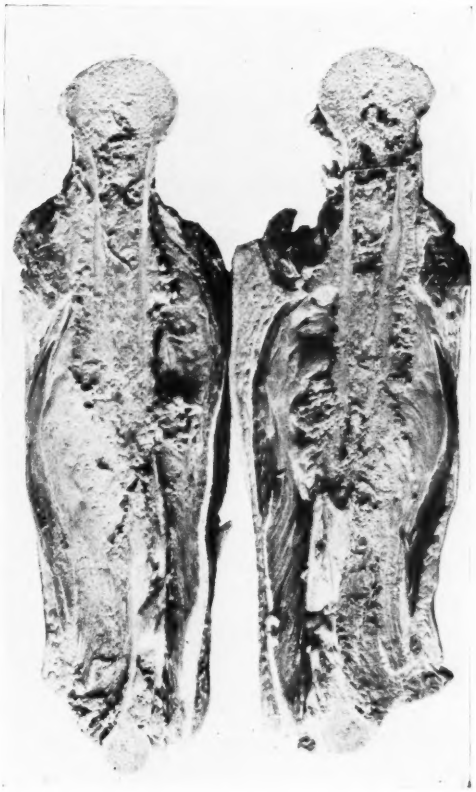


Fig. 10C. Case IV. Photograph of arm after longitudinal section.

was excised and the pathological report again was myeloma. The blood count at this time was R.B.C. 4,040,000; W.B.C. 10,850, of which 11 per cent were myelocytes, chiefly neutrophilic; hemoglobin 70 per cent. Re-entry March 24, 1922. Following previous entry had been well for about one month, then developed pain in the left groin and hip, later in the right groin and hip. Had been in bed eight weeks under therapy for rheumatism. In January, noted a nodule near the old excision line. This had increased to a large mass. General condition weaker. Physical examination at this time showed four masses on left side of chest in the axilla, bluish colored, nodular, attached to all surrounding structures (Fig. 11). Spleen not felt. There was no adenopathy. The blood count on this entry was: R.B.C. 5,000,000; W.B.C. 44,400, 19 per cent of which were myelocytes, chiefly neutrophilic; hemoglobin 70 per cent. X-ray therapy caused complete disappearance of axillary masses, which never subsequently returned. Patient complained of pain in left hip. This was radiographed and large ovoid, rarefied areas discovered in the upper femur, including the neck and great trochanter (Figs. 12 and 14). The application of X-rays to the femur gave great relief from pain. The white blood count was reduced to 10,000. Fourth re-entry occurred May 8, 1922. Weakness and pain in the right

Fig. 11. Case IV. On left: Recurrent infiltrating mass, March 25, 1922. On right: The same after radiation, April 7, 1922.

thigh. X-ray examination showed a slight periosteal reaction on the anterior and posterior aspects of the femur (Fig. 13). Blood count: R.B.C. 6,050,000; W.B.C. 29,000, of which 12 per cent were myelocytes with a slight basophilic preponderance; hemoglobin 70 per cent. The X-ray therapy given to bone lesions obtained relief of pain. Last re-entry was on October 24, 1922. The patient returned very sallow, anemic and weak. The spleen was much enlarged. Blood count: R.B.C. 2,255,000; W.B.C. 23,600, of which 43.7 per cent were myelocytes, with a great majority of neutrophiles; hemoglobin 50 per cent. There was a thickening of the left femur in the lower third which had appeared within the last two weeks (Fig. 14). At death, November 6, the white blood cells had dropped to 13,500.

Autopsy findings gave the following anatomical diagnosis: Primary.—Myelogenous leukemia, with enlargement of spleen and liver and hyperplasia of bone marrow. Leukemic tumors of femur, rib, vertebræ and ilium, with infiltration of periosteum and voluntary muscles. The following is taken from the protocol: "*Spinal cord.*—On opening through the dura in the lumbar region about 10 c.c. of clear cerebro-spinal fluid escapes. On the anterior and right surfaces of the cord there is a grayish cellular growth 3 to 6 mm. thick which extends 12.5 cm. along the cord in the dorsal region. The growth infiltrates the dura but the dura, with the growth, is easily separated from the cord beneath. After section of the spinal roots the cord in the region of the growth does not separate from the canal readily and in places it is necessary

to use a scalpel to separate the cord and attached tumor. *Femur.*—The left femur has been disarticulated at the hip and knee and removed, together with the muscle attachments over the lower third. At the junction of the middle and lower thirds

Fig. 12. Case IV. Radiograph of pelvis, April 7, 1922. Note large rarefied areas in upper end of left femur.

there is a grayish, cellular growth which has pushed outward the aponeurosis of the muscles and appears to infiltrate and to lie beneath the periosteum. The underlying bone is irregular. *Ribs.*—Over the fifth, sixth and seventh ribs on the right there is a flat, gray, cellular tumor growth which has raised up the parietal pleura 3 to 6 mm. It appears to infiltrate the periosteum. *Bodies of vertebræ and ilium (right).*—On the anterior surface of the dorsal vertebræ there is a sheet of gray, cellular growth, involving the dura and extending about the aorta. In this region the growth is about 1 cm. thick and does not extend definitely into the more reddish hyperplastic bone marrow of the bodies of the vertebræ beneath. This growth follows down along the right iliac vessels, is attached to the right ilium and in the concavity of this bone forms a mass 7.5 cm. across. On section, this mass consists of spherical, grayish areas suggesting enlarged lymph nodes. *Bone marrow* of ribs and vertebræ is abundant and of a dark reddish color. The marrow of the shaft of the femur is the size of a lead pencil and reddish (not gray) in color. It is rather soft and somewhat difficult to remove."

The following is taken from the microscopical examination: "*Spleen.*—The splen-

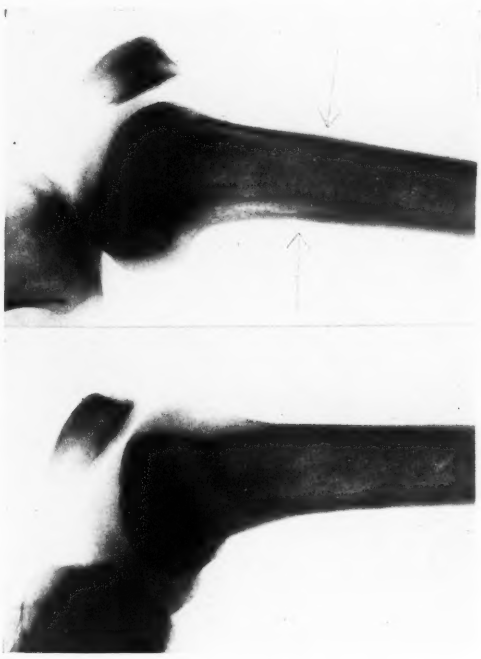


Fig. 13. Case IV. Above: Periosteal reaction on lower third of *right* femur, May 8, 1922. Below: The same area five months later.

ic nodules have been almost completely replaced by tissue like that of tumors in other parts of the body. The sinuses and venules are dilated and contain a large number of mononuclear cells, with distinct cytoplasm, which in places is tinged pink with a suggestion of a very fine granulation. There are also many cells similar to these, except that the cytoplasm is studded with coarse red granules. There are a few polynuclear neutrophiles, eosinophiles and an occasional large multinucleated cell. Between the definite blood channels there is an excess of connective tissue and cells of the same type as the intravascular ones. Other tumors show the same relative construction as that in the spleen. *Extradural tumor of*

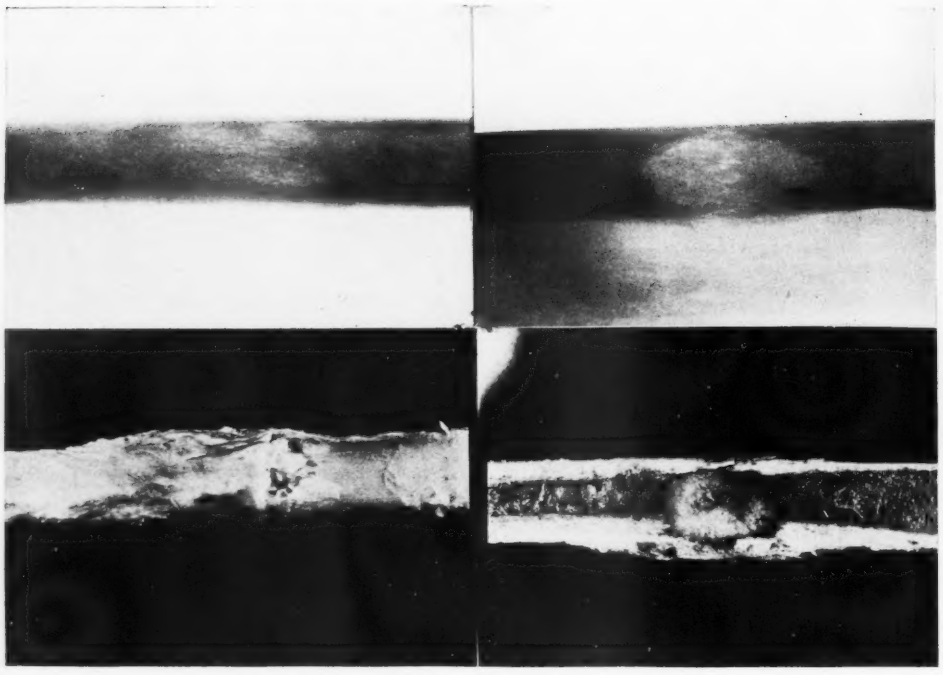


Fig. 14. Case IV. Above, on left: Lower third of shaft of *left* femur, April 7, 1922. On right: The same five months later. Below, on left: Photograph of this portion of femur removed at autopsy. On right: The same on longitudinal section of the bone. Note the tumor.

cord.—The tumor is intimately attached to the dura along one side and along the opposite side shows a small amount of fibrous tissue where it was attached to the periosteum. The tumor is quite homogeneous and consists chiefly of mononuclear cells supported by a delicate fibrous stroma. About one-half of the mononuclear cells have a distinctly red cytoplasm with an indefinite granulation. Polynuclear cells have a round or somewhat indented nucleus, which in many of the cells is somewhat excentrically located. Mitoses are readily found. More than one-half of the total number of cells present react with benzidine (peroxydase reaction). Many of the reacting cells have the usual appearance of neutrophilic myelocytes. *Left femur.*—The entire bone is sawed in the midline in the antero-posterior direction. At the junction of the middle and lower thirds of the shaft there is a light-colored round growth which completely replaces the more reddish marrow at this point and considerably distends the marrow cavity. The cortex is infiltrated and weakened and as a result the bone is accidentally fractured while sawing. The one on the outer surface is 1 to 2 cm. thick, is firmly attached to the periosteum and appears to be infiltrating the overlying muscles. When the periosteal growth is removed the surface of the femur is pitted and uneven where the periosteal growth has been pulled away. The marrow cavity averages 1.5 cm. across."

This last case is gone into very fully because of its inherent interest and for the further reason that, in spite of the clinical and postmortem opinions that it was a case of leukemia with peculiar manifestations, it was undoubtedly a chloroma of the myeloid type and presented malignant tendencies which removed it from the category of the ordinary myeloid leukemia, although it did have the following symptoms of the

latter: leukemic blood picture, splenic enlargement, weakness and anemia.

To summarize the features of this case, it had its beginnings in the involvement of the shaft of a long bone, where, in addition to producing fracture, it exhibited osteogenetic powers which resulted in producing a picture almost indistinguishable from that classical for periosteal sarcoma. It promptly recurred at the site of operation, manifesting the properties of an infiltrating growth and binding together adjacent soft structures. It showed evidence of producing metastatic growths of embolic nature through the deposits which later developed in other long bones, rather widely distributed in the skeleton, and also in the liver, spleen and dura of the spinal cord. Where it could be exactly observed, it proved remarkably amenable to X-ray treatment, with permanent result. Except for what may be considered the primary growth, the bone manifestations were those which one would conceive of being produced by an encapsulated and non-invasive type of tumor. At no time did the process appear as an expanding one. In none of the other 103 cases of leukemia on record in the Barnes Hospital (until January 1, 1924) have bone lesions of any sort been detected. This in spite of the fact that, owing to the fairly frequent symptoms of tenderness and dull pain over the bones, present in leukemia, which from time to time led to their radiographic examination, never has structural change been found. Therefore, the striking skeletal changes which this case presented remove it from the classification of myeloid leukemia. In fact, this case is unique, since its radiographic findings are dissimilar to those of any other bone affection.

Fig. 15A. Case IV. Spleen in section showing metastatic nodules.

Fig. 15B. Case IV. Photograph of portions of spinal cord and membranes showing large tumor growth.

In the literature there are but two reports of the X-ray features of chloroma: those of Allison (3) and of Gould and LeWald (4). All three of their cases were children and the evidence of their reports indicates them to be chloromata of the lymphoid type, the involvement confined chiefly to the bones

of the head and face, although there was some periosteal proliferation with longitudinal disposition on the long bones. Rowe and Hirschboeck (5) have dealt more recently and fully with the myeloid type of

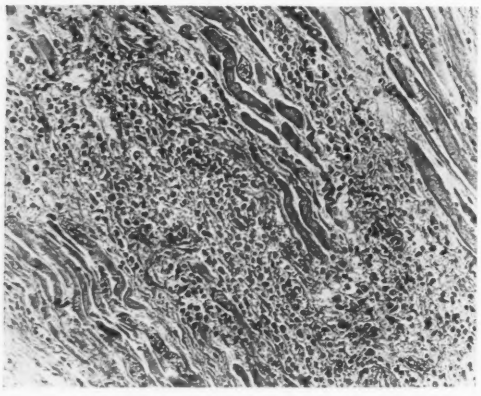


Fig. 15C. Case IV. Microphotograph, low power. Note cellular infiltration of muscles.

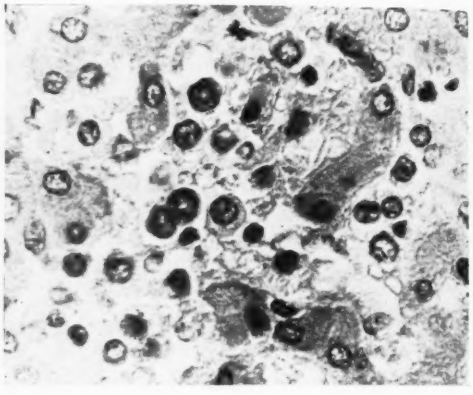


Fig. 15D. Case IV. Microphotograph, high power. Section of liver showing nature of infiltrating cells.

chloroma in a child, and covered the subject fully. Norris (6) also has given a full and interesting pathological discussion of this disease.

All of the writer's cases fall into the group of so-called systemic sarcomas and have largely, if not entirely, confined themselves to the hematopoietic system. Except that they arise in bone, have a wide distribution and cause death, they have none of the features of sarcoma as this is ordinarily observed radiographically. For example, metastatic sarcoma in the lung, so frequently found on X-ray examination of the chest, is lacking in all of the cases. Likewise, metastasis of sarcoma to multiple points in the skeleton is, in the writer's experience, never observed. It is true that late in the disease two of the cases, Cases III and IV, showed late metastases in the subcutaneous tissues, analogous to those observed in sarcoma, but essentially all four of these cases confined themselves to the blood-forming tissues. Many writers consider the possibility of these diseases being of infectious origin, or comparable to the infectious granulomata. The course, behavior and findings in them are preponderantly in favor of their being neoplastic. On this assumption they might be classified as suggested above, though it is true that histogenetically in these four cases but two types can be definitely isolated, namely, plasmocytoma and myelocytoma. In view of the confusion which exists in regard to the cytology of the blood-forming organs, it seems not unreasonable to suppose that the two remaining cases might be derived from a specific element of the bone marrow, as yet unidentified, since there were variations in the behavior of these tumors as registered in their clinical course and the bone changes produced. The fact that these growths were confined to the blood-forming tissues, which fact distinguishes them in behavior from sarcoma, may be explained on the basis of the impossibility of transported cells from such tumors finding suitable conditions for their growth and proliferation in tissues other than those of the same physiological identity as the ones from which they arose.

These cases, with the exception of the first, showed a varying blood picture, which can be variously interpreted. Case IV, which presented many of the features of a myelogenous leukemia, probably did so for the same reason that the other two cases showed myelocytes in their blood, *i. e.*, that the same factor which resulted in tumor-formation produced the blood picture (see

Dock and Warthin, 6). In other words, we have a tumor arising from the blood-forming organs in which the blood picture is but incidental.

The writer considers that there are four distinct malignant conditions exhibited in these four cases and that the peculiar histological picture found cannot be explained

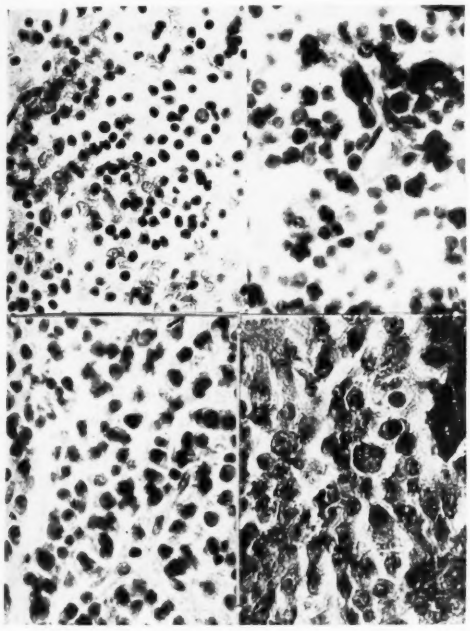


Fig. 16. *A.* Section of tumor from rib of Case I. *B.* Section of marrow from femur, Case II. *C.* Section of subcutaneous nodule, Case III. *D.* Section of tumor from arm, Case IV. Microphotographs made of characteristic fields in each case at the same magnification.

as a variant of the same process operative in all four and to be ascribed to anaplasia, as suggested by Ewing (*loc. cit.*). In support of this view he advances the idea that the diversified effects produced on, and observed in, the bones is to be explained only on the basis of a varying type of cell at work in the tumors in each of the cases. The bone changes here present differ from each other, and, further, they are unlike those observed in the other conditions which affect bone. This variation is adduced to support the idea that these tumors differ not only from each other but also from other tumors which have osseous manifestations. It is recognized that this claim rests on exceedingly treacherous ground, especially so when one recalls the rather protean manifestations of carcinoma when it is metastatic in bone.

Only when a solitary focus is present early in the disease is there any likelihood

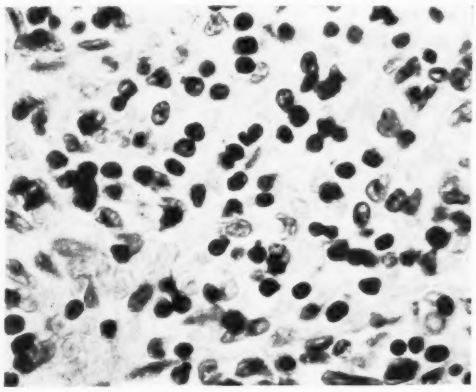


Fig. 17. Case II. Microphotograph of section of spleen. Contrast with Figures 15A-15D and 16.

of myelomata being confused with an infectious process in bone. Given this condition it would not be easy to determine whether a destructive lesion in, for example, a vertebra were tubercular in nature or myelomatous. This confusion happened in Case II. The other primary bone tumors would be difficult or impossible of differentiation from the early single focus of a myeloid tumor. However, the former are practically never multiple, and the latter are almost always so, at that period at which symptoms bring the patient for examination. The giant-cell myeloma is so characteristic in its manifestations that there should be no trouble in separating it from the myeloid myelomata, either when single or multiple. It is usually solitary, is found at the extremities of the long bones in which it produces some degree of expansion, and there is almost always some thin bony trabeculation to be found in the tumor. The sarcomata could scarcely be confused with the bony manifestations of these marrow

tumors except where a single focus was present, as in Case IV.

Of the secondary tumors of bone, only those invading by direct extension could produce a condition as observed in the pelvis of Case III. The other foci in the skeleton would serve to clear away any doubt. Where generalized, epithelial metastatic tumors of the skeleton usually show the effect of surrounding zones of bone reproduction resulting in bone density (Fig. 18). They do not expand. They are distinctly invasive and produce little or no periosteal response. The tumors of adrenal or thyroid origin would be difficult to differentiate, though they are more frankly destructive, and the lesions are likely to be on a larger scale than are those of the myelomata. The essential diseases of bone, osteitis deformans, osteomalacia, etc., are too distinctive to give rise to confusion.

Fig. 18. Barnes Hospital Case No. M. 11,996. Generalized skeletal carcinosis subsequent to bilateral breast carcinoma. Contrast with other pelvic radiographs.

Having failed to recognize during life the true nature of the process at work in any of these cases, save the first, the writer urges that they are distinctive, that they should be recognized, and, when observed, should at least suggest the possibility of being of medullary origin. This is considered important for the reason that, being systemic in character, it is essential that they be separated from the usual primary tumors of bone, as in the two conditions the treatment is radically different. The amputation of an extremity, for example, in a case of the above types, would certainly be a useless if not an injurious procedure, regardless of what one's views might be in respect to amputation in cases of bone tumors in general. It would also be disastrous to confuse a giant-cell myeloma with any of the foregoing types of cases and for the same therapeutic reasons.

This brings us to the consideration of the treatment of these conditions. Case IV had the arm amputated because of a painful pathological fracture. Although when the amputation was done we were in ignorance of the true nature of the process, it still seems to have been the correct procedure. Cases III and IV showed a strong tendency to infiltrate and metastasize, and symptomatically the patients derived enormous benefit from X-ray therapy. There is no question but that their lives were prolonged in comfort to a material extent through this agency. X-ray therapy, therefore, is in order in that type of myeloid tumor which presents such tendencies. The two remaining cases did not have these features. Case II when seen was in too weakened a condition to warrant employment of X-ray therapy. This agent was tried in Case I in the hope of giving some relief from pain, which result was not brought about. It would seem that the two latter types of cases can expect no benefit from radiation. Fractures that arise in the course of these diseases present no problem other than that found in pathological fracture from other cause.

SUMMARY

1. There have been presented for the first time the bone changes found in chloroma of the myeloid type, or a myelocytoma, for which a unique X-ray picture is claimed.

2. Four cases are studied and contrasted, for which diverse radiological find-

ings are described, as distinctive from each other and from other diseases involving bone.

3. They are likewise radiologically contrasted with an example of skeletal carcinosis.

4. A varying blood picture and clinical course is presented in the four cases, along with differing histological findings, which are claimed to be distinctive for four separate diseases.

5. These cases are presented to establish the idea that there are four malignant tumors of the bone marrow, distinct from the leukemias and from the other malignant diseases involving bone, and that they are not sarcomatous, but of hematogenetic origin.

REFERENCES

(1) EWING: Neoplastic Diseases, 2d edition, 1922, p. 298.
(2) CHRISTIAN: Jour. Exp. Med., 1907, IX, 329.
(3) ALLISON: Radiology, Nov., 1924, p. 388.
(4) GOULD and LEWALD: Arch. Ped., 1916, XXXIII, 417.
(5) ROWE and HIRSCHBOECK: Am. Jour. Dis. Child., 1922, XXIV, 239.
(6) NORRIS: Proc. New York Path. Soc., n. s. 4-6, 1904-06, p. 128.
(7) DOCK and WARTHIN: Trans. Assn. Amer. Physicians, 1904, XIX, 64.

Roentgenologists' keratoses.—The small keratoses of the skin are most commonly seen on the hands and faces of roentgenologists who were exposed excessively during the early days when the dangers were unknown and the means of protection undeveloped. The picture is quite familiar. There may or may not be an erythema, but sooner or later the skin becomes smooth and glossy; it loses its velvety appearance; the nails become thin and brittle and break or split. Then small scales or crusts or perhaps warts or corns develop. The oil glands have been destroyed and if the hands are not kept lubricated, fissures will develop. Any of these lesions may become malignant, and give rise to metastases.

The time to treat these lesions is at their beginning. When atrophy of the skin is shown, much can be accomplished by lubricating the skin after every washing of the hands or face. Lanolin is the best, or, instead, good cold cream, applied while the hands are wet and then thoroughly dried, will do much good.

Desiccation, using a high frequency Oudin current, is indicated whenever the lesions are small and superficial. It should be used in all of the keratosis fissures and warts. Amputation is better when the lesion extends down to the bone. The author believes that electrical desiccation is a better method than excision. A wound from excision will heal sooner and with less discomfort, but the result will be less permanent, because the excision does not stimulate the development of new blood vessels.

Following the destruction by electrical desiccation, there is a violent reaction, with sloughing and desquamation of the dead tissue. In small lesions this requires from two to four weeks. This reaction, however, seems to lead to the development of new capillary blood vessels, and, as a result, better nourishment of the affected part. There follows a pink, pliable scar which may be all but invisible. A central keratosis may develop and require a second treatment.

Fibrosis and secondary malignant degeneration may develop over areas that have received either unfiltered or filtered radiation. If these areas are located where they can be completely excised and good healthy tissue exposed everywhere, excision is the shortest and easiest way out of the difficulty. Frequently complete excision is impossible. If the fibrotic area cannot be improved by massage, it is probably best to destroy the entire area by electrocoagulation, carrying the destruction down into the healthy tissue.

J. D. CAMP, M.D.

Electrocoagulation or Desiccation in the Treatment of Keratoses and Malignant Degeneration which Follow Radiodermatitis. George E. Pfahler. Am. Jour. Roentgenol. and Rad. Ther., Jan., 1925, p. 41.

X-RAY TREATMENT OF BONE TUBERCULOSIS[1]

By J. D. SOUTHARD, M.D., F.A.C.S., Fort Smith, Arkansas

FROM time immemorial tuberculosis of the bone has been considered and treated as a surgical condition, notwithstanding the fact that surgery in this disease has generally been unsatisfactory both to surgeon and patient. It is my belief that in the X-ray treatment of this disease a brighter day is dawning for the unfortunate individual who is suffering from bone tuberculosis.

Fig. 1. Showing disease of hip joint, with destruction of bone tissue about the socket and neck of femur.

Fig. 2. Same case as Figure 1, showing condition four months after beginning treatment, with marked increase of density of new bone tissue about diseased and damaged areas.

I began the treatment of bone tuberculosis with the X-ray more than five years ago. If anyone had preceded me in this particular field, a diligent search through the literature of this country has failed to discover the fact. Up to one year ago I had treated twenty-seven cases, which form the basis of this paper and preliminary report. Only cases in which the treatment was completed one or more years ago are included, in order to give time for estimating results with respect to permanency. Among them are six cases that had been operated upon twelve times with little or no permanent improvement, in each of which, months after operation, there were still one or more discharging sinuses communicating with the diseased bone. A large majority of these cases were of the worst type, cases of long standing. The treatment time was, therefore, longer than it will be when this form of treatment is better known and cases are seen and treated earlier. The average treatment time for the twenty-two cases cured was a little over four months.

The technic had to be varied according to the age and size of the patient and the location of the diseased bone, but in the average case, using the cross-fire method through as many portals as are available, I intend to give from one-half to one erythema dose of filtered rays during the first month of treatment. No massive or lethal dose is needed and none is used. There is nothing to kill. The field is already strewn with dead and dying cells. The indication is to stimulate, nourish, and encourage the living cells and tissues, to dispose of the dead by elimination or absorption, while at

[1] Read before the Radiological Society of North America, at Kansas City, December, 1924.

the same time the phagocytes are invited and encouraged to feast upon the tubercle bacilli present.

It is not my purpose to discuss or theorize as to the exact manner in which the X-ray cures these tuberculous conditions;

Fig. 3. Showing disease of sacrum from the posterior portion of which there was a discharging sinus communicating with the diseased bone. Right thigh was completely flexed upon the abdomen so it was impossible to get a film of the hip joint, which was the seat of firm fibrous ankylosis.

we know that it is capable under favorable conditions and proper use, of greatly benefiting almost every form of tuberculosis, including that of the lung, kidney, peritoneum, skin, lymphatic glands, etc., as well as that of the bones. Its effect in spinal tuberculosis, of both children and adults, has been particularly gratifying to me because, in the five cases treated, no rest measures were used as in most of the others. None of these patients was confined to the house; on the contrary, they all were encouraged to move about in the open, always on crutches when these were needed, and the usual hygienic measures were carefully attended to. In cases where the lungs were found to be involved, they were also treated, and were usually healed or quiescent by the time the bone was cured. As may be seen by the table presented herewith, the percentage of cures was above eighty.

Fig. 4. Same case as Figure 3, showing condition four and one-half months after beginning treatment. Patient now walks normally.

TABLE I, SHOWING 81.13 PER CENT CURED ONE OR MORE YEARS BEFORE REPORT, ALL OF WHOM HAVE REMAINED WELL SINCE

BONES INVOLVED	Number	Cured	Improved
Ankle	1	1	..
Arm	3	3	..
Femur	1	1	..
Foot and Ankle	1	..	1
Hip Joint	5	4	1
Knee Joint	2	1	1
Pelvis	2	2	..
Spine	5	4	1
Sacrum	3	3	..
Sternum	2	2	..
Wrist	2	1	1
Total	27	22	5

At one time it was thought that active tuberculosis of the bone was always destructive of bone tissue; however, this is not always true. In some cases there is proliferation of the bone cells wherein new bone tissue is formed, which seems even denser than the normal bone of that part. This increased density is particularly noticeable in some cases, as the healing process takes place. In some instances of considerable

bone destruction I have seen the defect entirely fill up by bone regeneration during treatment.

CONCLUSION

I realize, as a matter of course, that the number of cases here reported is not sufficient upon which to base any final conclusions; I offer them merely as pointing the way to a safe, sane and effective treatment of a most intractable disease, which has heretofore been resistent to other methods of treatment, and which has crippled and is crippling untold thousands of our race, both adults and children.

Nasal accessory sinuses.—This is a report of a new method of taking roentgenograms of the nasal accessory sinuses, diagrams accompanying the text showing the position of the patient. Plates resulting from the use of this position as contrasted with Dr. Waters' method are shown.

The author's method: Elevate the cassette with double screens at an angle of 23°. Have the patient's nose, opened mouth and chin touch the center of the plate. Take an ordinary sinus tube and place the anode over the center of the vermilion border of the upper lip. Use a fairly hard tube (gas tube), 35 milliamperes, 4 gap, and an exposure of 3 seconds. Place the cone snugly against the head. Using the Bucky diaphragm at an angle of 23° and giving a 6-second exposure for the posterior-anterior view result in a clearer picture.

Dr. Waters uses the plate lying flat, with the patient's chin resting on it, the nose from 1 to 1.5 cm. from it, the long axis of the tube parallel to the plate, and the anode of the tube parallel to the nose tip.

The author considers the opened mouth an advantage, as it stabilizes the antrum and brings it nearer to the plate (eliminating the variability factor to be found in Waters' method), and it allows the sphenoid to be seen below and behind the thin horizontal portion of the palate bone, instead of being superimposed upon the lower and inner part of the antrum, as in Waters' position.

The author's position shifts the petrous portion of the temporal bone *below* and behind the antrum so that it never clouds the lower part of the antrum, as may happen in Dr. Waters' position, where the petrous portion is seen behind the lower angle of the antrum.

The new method gives a clearer picture, as the rays do not penetrate so great a thickness of bone as in the Waters position. Having the nose, opened mouth and chin to rest against the plate, the patient is less likely to move, and a better chance of obtaining both antra on the same plane is secured. The new position allows more of the deeper part of the antrum to be seen.

A second method, used to show the sphenoids and another angle of the antrum, is outlined: Using a 23-angle wooden block, place the chin on the hypotenuse so that the imaginary line from the glabella to the hypotenuse forms an angle of 90° with the hypotenuse. Thus the base of the sphenoid lies parallel to the inclined plane. In this position any pus in the sphenoid will descend to the front part, where the base is thinner than at the back part. In this way pathology in the sphenoids can be more readily detected. The time of exposure in this second position is from 3½ to 4 seconds.

The second method not only gives another view of the antra and sphenoidal sinuses, but also shows the base of the skull and its foramina, and the mastoid cells on either side. Thus it is of value in cases of fracture of the base of the skull and also in mastoid cases. In the latter, it eliminates variability, as both mastoid processes show on one plate. The author suggests, in mastoid cases, that the Bucky diaphragm be tilted to an angle of 23° and that an exposure of 4 seconds be used, the cone lying directly over the temporo-parietal region and not being filled.

A New Technique in the Roentgenography of the Nasal Accessory Sinuses. Maxwell Maltz. Laryngoscope, July, 1924, p. 550.

RADIATION TREATMENT OF BONE TUMORS [1]

By WILLIAM E. COSTOLOW, M.D., Los Angeles

THE question of the proper treatment of bone tumors is one which has long been under consideration and one in which there has been considerable difference of opinion. Until quite recently, practically the only treatment considered was surgery and this usually meant radical amputation of the involved part. However, there has been a tendency to the less radical surgical treatment, especially of the benign bone tumors, since Bloodgood pointed out that many could be cured by simple curettage. Even in malignant cases, the field of surgery is very limited, as metastasis has usually occurred or cannot be prevented by the time the case is first seen.

With the increasing advance in the science of radiation therapy in the treatment of all types of neoplasms, more attempts are being made to successfully treat bone tumors by radiation. The increasing reports of cases in the literature, especially the recent work of Herendeen (1) and of Palmer (2), show that advance is being made.

The purpose of this paper is not to outline any régime of treatment for bone tumors but merely to give a preliminary report and analysis of three of the earlier cases of a series which have been under radiation treatment with definite benefit. The other cases of the series have been under observation less than one year and will not be described at this time.

Of the three cases we will report, the first two were probably benign, although biopsy was not done. The third case was reported spindle-cell sarcoma at the time biopsy was taken, but later giant-cell sarcoma. The boy is twelve years of age, an unusual age for giant-cell tumor, the youngest patient in Meyerding's (3) series of cases being sixteen years of age. This, together with the history and the X-ray evidence in this case, points more to periosteal sarcoma than to giant-cell tumor. The first two cases were treated with copper filtered high voltage X-ray, while the third case was treated with moderate voltage aluminum filtered X-ray and buried lightly filtered radium.

In the treatment of bone tumors of the extremities, the method advised by Juengling is to be recommended. He uses square aluminum boxes which surround the involved area and are filled with fuller's earth or an organic preparation, as radioplastin. This method insures a more homogeneous radiation to all parts by utilizing the scattered radiation. Also, four exact portals of entry may be used.

Case No. I.—Female, age 12, reported for treatment December 5, 1922.

Chief complaint: Pain and swelling of anterior surface of upper part of left tibia.

Past medical history: Measles and mumps in childhood, otherwise always well and healthy.

Family history: Father and mother living and well. No history of tuberculosis or malignancy in family.

History of present illness: About three years previous to examination the patient had quite a severe fall, striking the left shin and causing considerable skin abrasion. Following this, the swelling and tenderness remained on the anterior surface of the tibia for several weeks, but gradually disappeared. About two years later she again noticed some pain in the same area at times, and there has been a gradual enlargement of the bone in this area. During the past few months the pain has been almost constant, and severe. Tenderness is increased when she walks and she has been unable to attend school recently. Had X-ray examinations made recently, which showed a bone growth. Has been advised

[1] From the Soiland Radiological Clinic, Los Angeles, California. Read before the Radiological Society of North America, at Kansas City, December, 1924.

Fig. 1. Case I, before treatment.

by several physicians to have leg amputated, but this has been refused.

Examination: Poorly nourished young girl. General examination negative. There is a rounded outward expansion on left tibia about 7 cm. wide at thickest part and elevated from the remainder of the bone about 3 cm. Enlargement is hard, but tender on pressure. Patient walks with great difficulty. Wassermann negative.

X-ray examination shows expanded area in upper portion of tibia, thinning the cortex. This is intact, however. The disease

Fig. 2. Case I, one and one-half years after Figure 1, showing repair with new bone formation.

extends longitudinally in the shaft of the bone and striæ of lessened and increased density occur. These resemble new bone production. The condition resembles osteitis fibrosa cystica, although, as a biopsy was not done, central sarcoma cannot be ruled out.

Treatment and progress of case: Four areas were taken, anterior, posterior and right and left lateral over the lesion, and each area given about two-thirds of a skin erythema dose. The following formula was given to each area: K.V. 220, distance 53 cm., filter 1 mm. copper and aluminum, 4 ma. through the tube and 120 min. time to each area. These treatments were given at four- or five-day intervals, giving sixty minutes at each treatment.

One month later there was considerable reduction in the size of the external swelling and the pain was much less. Two

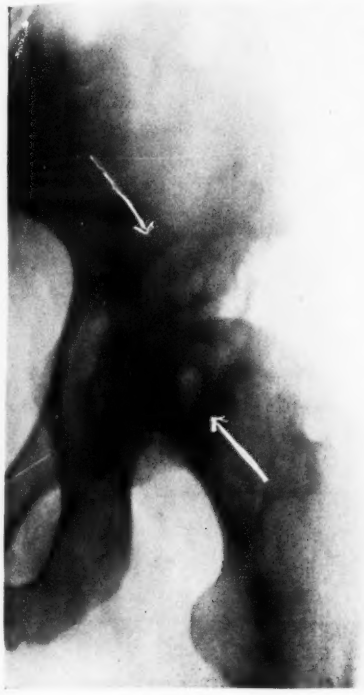


Fig. 3. Case II, before treatment.

Fig. 4. Case II, one year after Figure 3, showing disease practically eradicated.

months later the pain and tenderness had entirely disappeared and the enlargement was considerably reduced. X-ray examination showed some lime deposit in lower portion of tumor.

Patient returned to school and has not had any pain, tenderness or symptoms in the limb since, although two years have elapsed. Patient's general condition good and she is growing and developing normally. Recent roentgenograms show considerable new bone deposit throughout original diseased area and especially in lower portion.

Case No. II.—Male, age 38, reported for treatment February 28, 1923.

Chief complaint: Pain in left hip, and lameness.

Past medical history: Had measles, mumps and whooping cough. Typhoid in 1893. Pneumonia in 1912. No history of injuries. No history of venereal infection.

Family history: Father died of tuberculosis. Mother living and well. One brother and one sister living and well. Unmarried. No history of malignancy in family.

History of present illness: In 1910 patient noticed pain and soreness in left hip. This became practically constant and has gradually grown worse. This soreness caused him to walk with a limp. After a while this trouble seemed to improve but he continued to have repeated attacks of pain and soreness in the region of this hip. Since 1910 he has not been without symptoms more than two or three days at a time. His limp seemed to increase. The pain and soreness recently have been very severe. Swings the leg when he walks in order to avoid placing his weight on this limb. Has tried various treatments, including osteopathic, without success.

Examination: Wassermann negative. Measurements show both limbs same length. Left thigh about one inch smaller

than the right. Apparently no actual limitation of motion at hip joint but extreme flexion, extension and rotation are painful. Marked soreness in joint. Walks with swinging motion of leg and a decided limp.

Fig. 5. Case III, before treatment.

Has moderate varicosity of veins of left leg.

X-ray examination shows thinned out area of bone involving region of acetabulum and adjacent portion of ilium. Cortex of bone is not involved. The area seems reticulated and loculated. It is limited and not invasive. Diagnostic possibilities are cyst, giant-cell sarcoma or osteochondroma. No biopsy was made.

Treatment and progress of case: On February 28th, high voltage X-ray treatment was begun. Three areas, 15x15 cm. in size, were used over the left hip joint, anterior, posterior and lateral. Each area was given about two-thirds of an erythema skin dose, using 220 K.V., 55 cm. target distance, 1 mm. copper and aluminum filter, 4 ma. through the tube and 120 min. time to each area, a sixty-minute dose being administered every three days.

Six weeks later the patient reported pain and soreness entirely gone from hip region; he moved leg freely and limp had practically disappeared. Three months later he was still free from symptoms and X-ray examination showed marked lime deposit and bone formation, which had

Fig. 6. Case III, showing tumor after radium was buried and a period of six months had elapsed.

practically eliminated the original area. Patient is still free from symptoms about twenty-two months following treatment.

Case No. III.—Male, age 12, applied for treatment June 16, 1921.

Chief complaint: Pain in left thigh and a rapidly growing tumor.

History of present illness: About four weeks previous to examination, patient noticed pain in middle of left thigh, with swelling. This swelling has rapidly increased in size until, at present, a noticeable lump can be seen and felt on the left thigh. Moderate pain, more pronounced after walking.

Past medical history: Patient has always been well, except for measles and mumps. Wassermann negative.

Family history: Negative.

Examination: Hard rounded mass can be felt on lateral aspect of left femur. Widest part of mass has a diameter of about 10 cm. Several enlarged glands in left inguinal region, largest about 1 cm. in diameter.

Fig. 7. Case III, three and one-half years after treatment; bone deposit; no sign of activity.

X-ray examination: In the original examination made by the family physician, a small plate was used which was overexposed and the detail was not clear. However, a tumor mass can be made out near the upper portion of the femur, with marked extension into the soft tissues. The bone changes seem to be entirely outside the bone proper, the mass apparently growing from the periosteum.

Pathological report: On June 8, 1921, an exploratory incision was made over the mass, and a specimen removed for diagnosis. The original report was spindle-cell sarcoma, but this was later changed to giant-cell sarcoma, one pathologist reporting, "tumor of an inflammatory nature showing bone regeneration." Another pathologist reported as follows: "The bone is very loosely formed, like new bone. There is an unusual amount of fibrous connective tissue. The inner patch of gray tissue is found to be made up of spindle cells, like young fibrous tissue, with numerous giant cells scattered through it. They are of the foreign body giant-cell type. In the cellular fibrous tissue are a few mitotic figures, though few of the nuclei are hyperchromatic."

Treatment: Rubber tubes were inserted into the mass. On June 10, 1921, 50 milligrams of radium element, filtered by 0.5 mm. silver and a thin rubber tube, was inserted into the center of the growth for a total of 750 milligram hours. Two days later this dose was repeated, the radium being applied into the drainage tube. Following this, there was considerable sloughing and soreness in the wound. On June 27, 1921, X-ray treatment was commenced. The area around the tumor and inguinal glands was divided into areas 8x8 cm., and the following formula given to each area: 130,000 peak voltage, 25 cm. skin distance, 5 ma. through the tube, 4 mm. of aluminum filter, and 10 minutes time. The entire area was covered three times with this formula, the last series being completed November 4, 1921. He has not been treated since that time.

During and following the treatment, there was marked regression of the tumor and decrease in the pain. The wound completely healed. The enlarged inguinal glands disappeared. After two months, the boy returned to school, and has been apparently free from symptoms since, although about three and one-half years have elapsed. He is growing, is normal for his age in weight and strength, and played on the high school football team the past season.

A roentgen examination at this time shows irregular bone formation, extending outward from the posterior surface of middle third of left femur. Resembles bone formation of repair, rather than tumor. Apparently nothing present to suggest activity.

SUMMARY

The cases treated are free from symptoms and clinically well, and there has been no evidence of recurrence of the disease in any of the cases. A study of these cases shows that the bone growths have been definitely influenced by the radiation, the disease arrested, lime salts and new bone deposited.

Not enough work has been done on the radiation treatment of definitely proven malignant bone tumors to draw any conclusions regarding these cases. We believe the above cases, together with many others recently reported throughout the world, show undoubtedly that the benign bone tumors especially can be controlled by radiation. No damage is produced by proper radiation and in the light of the definite value so far obtained in cases of bone tumor, we believe that a thorough course of radiation should be given in all cases of bone tumor, regardless of what other form of treatment is to be pursued.

BIBLIOGRAPHY

(1) Herendeen, R. E.: Roentgen Ray in Treatment of Giant Cell Tumors. Am. Jour. Roentgenol. and Rad. Ther., Aug., 1924, p. 117.

(2) Palmer, Myron B.: Roentgen-ray Treatment of Bone Sarcoma. Am. Jour. Roentgenol. and Rad. Ther., June, 1924, p. 550.

(3) Meyerding, H. W.: Benign Foreign Body Giant Cell Tumors in the Long Bones. Jour. A. M. A., October 25, 1924, p. 1323.

DISCUSSION

Dr. L. T. LeWald (New York): The cases of Dr. Moore are very interesting and well presented; especially the chloroma case was interesting to me, because we have had an opportunity to study two cases of chloroma. While Dr. Moore states that the chloroma manifestations that we reported in the long bones were periosteal, we also made the observation that they did also involve the medullary portions of the bone, and if he will go over that communication he will see that we call particular attention to the fact that the medulla shows reaction as well as the periosteum. I particularly called attention to that fact, because I thought it was of diagnostic importance as distinguishing the condition from any other bone condition in which there is reaction in the medulla or in the periosteum alone.[1] As to the type of cell and the gross appearance of the tumor, I think his case is unique and is of sufficient importance to warrant its review at some future time in connection with these other cases of chloroma. It is odd that so few cases of chloroma have been reported.

Dr. P. M. Hickey (Ann Arbor): With regard to the treatment of lung tuberculosis, I think it is best to add a little warning that you must differentiate carefully as to the type of tuberculosis that you have to deal with. If you have the exudative or inflammatory type, you will do your patient a great deal of harm if you give him X-ray treatment. The radiation treatment for pulmonary tuberculosis should be confined strictly to the productive type, and used only in very small doses and at long intervals.

Dr. Henry Schmitz (Chicago): I think the suggestion of Dr. Hickey very timely. In treating tuberculosis we should be careful as to the applied dose. We usually give about one-twentieth of a full E.S.D. If we are not very careful we will cause more harm to the patients than we may account for. We must begin with absolutely infinitesimal doses. The object is to stimulate the reparative processes to promote healing. If we apply too large amounts to the tuberculous process, we will kill more patients than we will benefit.

Dr. I. S. Trostler (Chicago): I want to reiterate that all the benefit we ever had in pulmonary tuberculosis from X-ray treatment was the effect it had upon the gland structures in the thorax. I have stated that before various meetings for the last twelve years and have not yet heard it disputed.

Dr. J. D. Southard (Fort Smith, Ark.): At the outset, before beginning to read my paper, I wish to say that I believe the greatest field for radiotherapy, not excepting that of cancer, lies in the treatment of the vari-

[1] Chloroma: A Report of Two Cases. L. T. LeWald, M.D., and Everett W. Gould, M.D. Archives of Pediatrics, June, 1916, Fig. 7, Case 2.

ous forms of tuberculosis. This opinion is based upon an experience and the results of that experience in the treatment of some seven hundred cases of tuberculosis of the various forms. [Here paper was read.]

One gentleman said he wished I could make it more emphatic and more convincing. So do I, and I hope to do so later, when I shall make a supplementary report. I know it is necessary for us to see some of these cases and the results with our own eyes in order to be convinced, but when you have seen even as many cases as I have seen and treated, you will be convinced as to the efficacy of this treatment of bone tuberculosis, at least. Now Dr. Trostler, as we all know, is a man of wide experience in X-ray work of all kinds; he says he has been telling us for twelve years that X-ray is not worth much in the treatment of lung tuberculosis. How does he know this? Has he used it extensively these twelve years past while telling us it was no good? A little prior to that time, we had no suitable equipment for doing this work. Of course, I do not know how many cases Dr. Trostler has treated as a basis of his opinion, but unless he has had some considerable experience with it in the treatment of lung tuberculosis, I do not know that his opinion of its value in such cases is worth any more than mine or yours. [Laughter.] I have had considerable experience and the result of my experience has been very gratifying indeed. However, my paper was not upon lung tuberculosis. I do not believe there is any place for large or massive doses in the treatment of any form of tuberculosis. I do not use large doses; I watch my cases very carefully and I get results that are very satisfactory to my patients as well as gratifying to myself.

Dr. Byron C. Darling (New York): I want to call attention to the importance of Dr. Costolow's paper and his conclusion. If all these bone tumors are benefited by radiation rather than biopsies and operation, it is a very important matter. I believe that that is Ewing's position,—that amputation in malignant bone tumors does no good, unless, of course, in cases where the tumor is mechanically disabling or for other reasons has to be removed, then the limb may have to be amputated; but the general proposition of radiation on bone tumors first, instead of other methods, seems to be well grounded and well indicated.

I want to say a word about Dr. Southard's bone tuberculosis treatment by the X-ray. Of course he has not proven his case and he ought to go over his work carefully and bring it out, perhaps, in a more convincing manner. I want to say a word about radiation in general. I think that, in view of what Dr. Carman has brought out and what we all know, radiation is a thing to be used with very considerable forethought and caution. There are untoward symptoms which you must consider very carefully, and I do not think we ought to radiate one gland more than we have to under any circumstances. If you have to take in a gland in your field, be sure that you realize what you are doing and always have it in the forefront of your mind that you cannot exhibit this potent force with impunity; it is not a thing that does only good and never does evil. Now it is very tempting to want to radiate tuberculous chests and lungs, but what do you have? A chronic condition, and if you keep on radiating that chest, you want to be very sure that you are well grounded in the use of your remedy, and you cannot keep on radiating patients anywhere without doing them some damage, and you have to weigh the damage which you are doing against the good you are doing.

Dr. Sherwood Moore (closing): There is nothing I wish to add. I would like, however, to set Dr. LeWald right. I carefully studied his report as, incidentally, I did all other reports concerning cases of chloroma that I could get my hands on, but I do not remember that it was clear in his report in the *Archives of Pediatrics*, 1916, that the medullary changes were present. I do believe that my case is the first one of chloroma of the distinctly myeloid type, of which the X-ray features have been developed.

NEW DEVICE AND TECHNIC FOR MAKING RADIOGRAPHS OF THE MASTOIDS IN THE LAW AND IN THE ARCELIN POSITIONS[1]

By AMEDEE GRANGER, M.D., F.A.C.R., O.d'A. (France), Director, X-ray Department, Charity Hospital; Professor of Radiology, Post-graduate Medical School, Tulane University. NEW ORLEANS, LA.

IN this country, radiographs of the mastoids are almost universally made with the head in the position recommended by Law (1). This position is a modification of the one suggested by Lange (2) in 1910. Of late years, a position of the head recommended by Arcelin (3) has gained great favor with the French radiologists. We have been using both these positions and find that when good radiographs are obtained, they both furnish valuable information about the condition of the mastoids. However, it is not the purpose of this paper to enter into a discussion of the relative merits of these two positions.

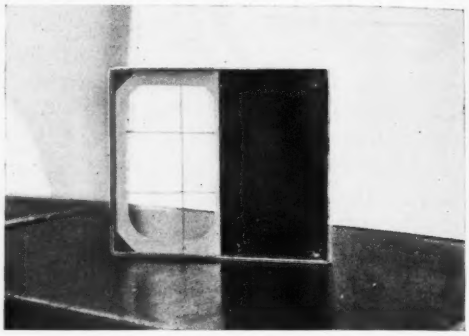


Fig. 1. Original Granger Mastoid Localizer with thread guides.

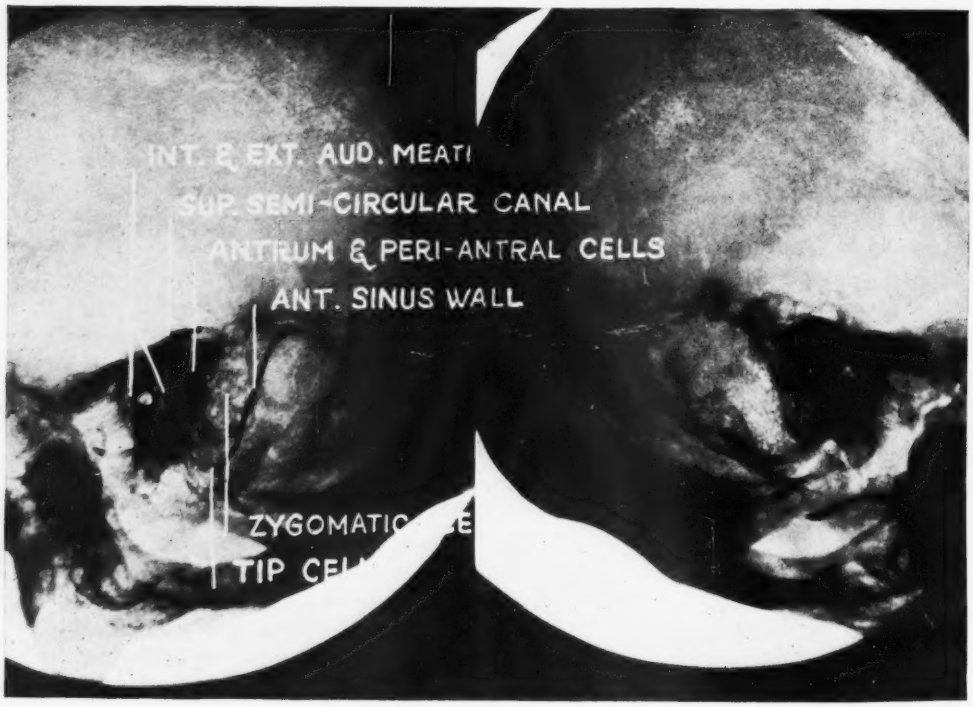


Fig. 2. Radiograph made in the Law Position of a skull having lead wires attached to the anatomical structures producing the shadow landmarks seen in Figure 10.

[1] Read before the Radiological Society of North America, at Chicago, June, 1924.

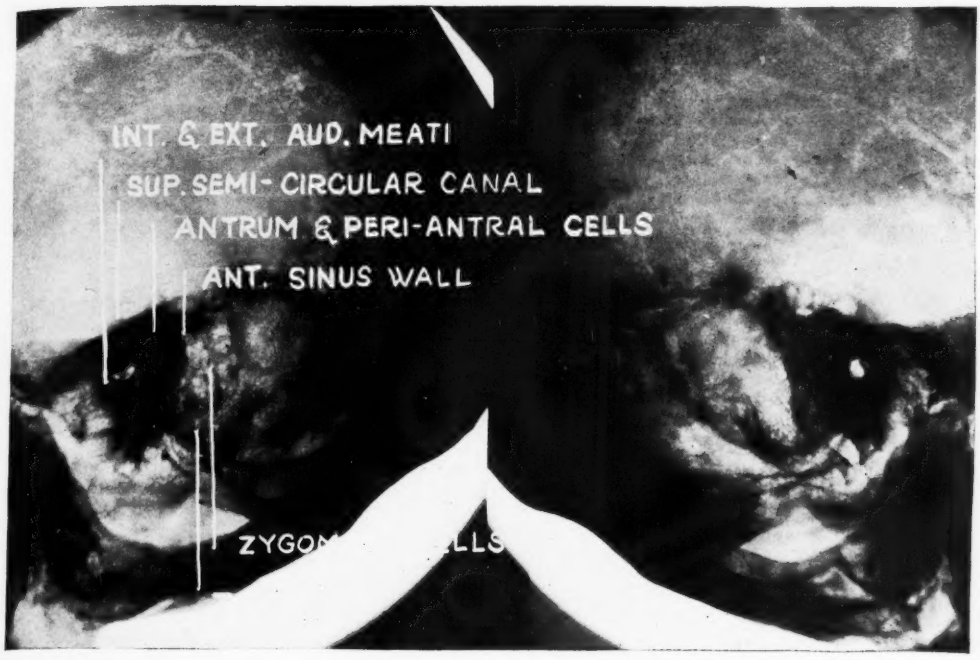


Fig. 3. Radiograph made in the Law Position of a skull having the antrum and peri-antral cells filled with a heavy paste of bismuth.

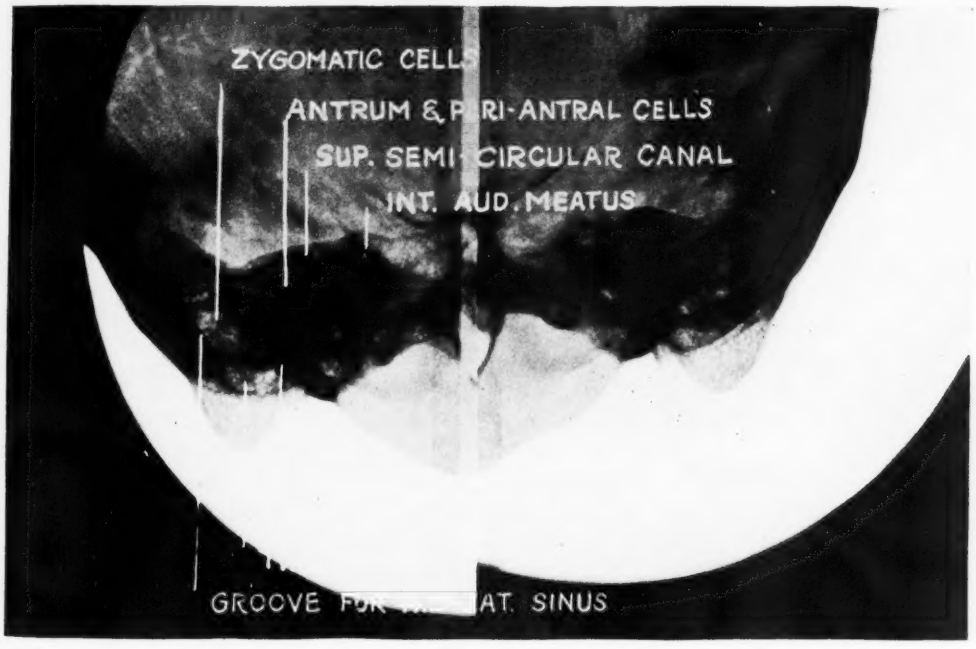


Fig. 4. Radiograph made in the Arcelin Position of a skull having lead wires attached to the anatomical structures producing the shadow landmarks seen in Figure 14.

Fig. 5. Radiograph made in the Arcelin Position of a skull having the antrum and the peri-antral cells filled with a heavy paste of bismuth.

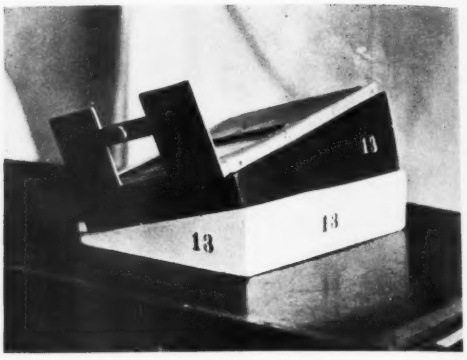


Fig. 7. Granger Mastoid Localizer in position on two properly placed 13 angle blocks to make a radiograph of the mastoid in the Law Position.

Although we have followed faithfully the technic so fully described and in so masterly a manner by Law and by Arcelin, still we have found it difficult to obtain uniformity and duplication in our mastoid work, even when considerable time and effort were expended.

For over two years, when making radiographs of the mastoids in the Law position, we have been using a mastoid board (Fig. 1), consisting of a sheet of metal attached to a metal frame by means of which it can be held over an 8 x 10 cassette. Nearly one-half of this sheet of metal is cut away to form a large oval aperture on one side, and the other half is backed with a sheet of lead. Three silk threads stretch across this oval aperture, one in its long or vertical diameter, the other two, three inches apart, in its small or horizontal diameter. This mastoid board was found helpful because it not only protected one-half the film during the exposures, but the silk guides assisted very materially in centering and levelling the mastoid regions on the cassette.

Even then we were not able to obtain the uniformity and duplication which can be seen in radiographs of the paranasal sinuses made with the head held in the alveola-glabella position. After experimenting with dried skulls, we reached the conclusion that this was due to the fact that it was well-nigh impossible to accurately center the tube when it is tilted at the required angles, and to place the two mastoids in identically the same position on the cassette.

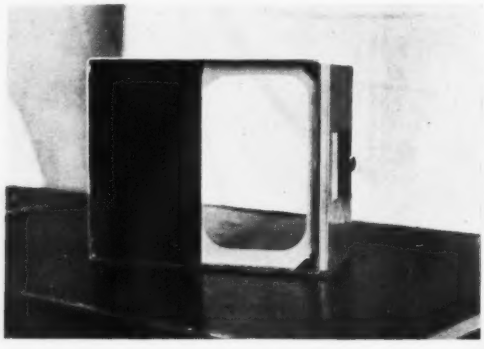


Fig. 6. Granger Mastoid Localizer with upright metal plates and adjustable horizontal bar, for fixation of the upper jaw, nose and forehead as shown in Figure 9.

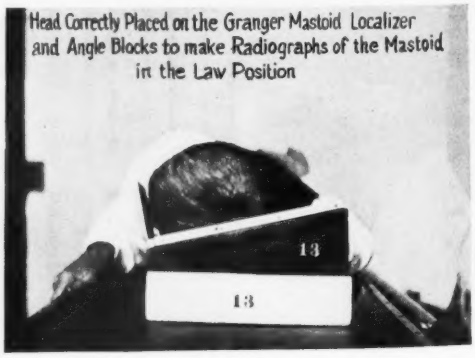

Head Correctly Placed on the Granger Mastoid Localizer
and Angle Blocks to make Radiographs of the Mastoid
in the Law Position
13
13

Fig. 8.

Head Correctly Placed on the Gr ger Mastoid Localizer
and Angle Blocks to make Radio phs of the Mastoid
in the Law Po ion.
13

Fig. 9.

Encouraged by the results obtained in our sinus work by the use of angle blocks and a vertical ray, we determined to try this with the mastoids. Accordingly, two skulls, one with the peri-antral cells filled with opaque material, and the other with the important anatomical landmarks marked by means of pieces of lead wire for positive identification, were placed on inclined boards of the proper degree of angulation and radiographed with the central ray focussed vertically over the points recommended by Law and Arcelin.

Time and care were taken to make the radiographs shown as Figures 2 and 3 (Law position) and Figures 4 and 5 (Arcelin position) and although the result was encouraging, close inspection shows that their uniformity was still not quite as good as we had hoped to obtain.

We could not now help but reach the conclusion that this was due to some slight difference in the rotation or inclination of the skull, and our next care was to prevent this from taking place, if possible. After studying this problem for some time, we decided to make use of the same constant points of contact—the alveola and the glabella—to center, fix, and steady the head on the cassette when making radiographs of the mastoids in the Law position, which we

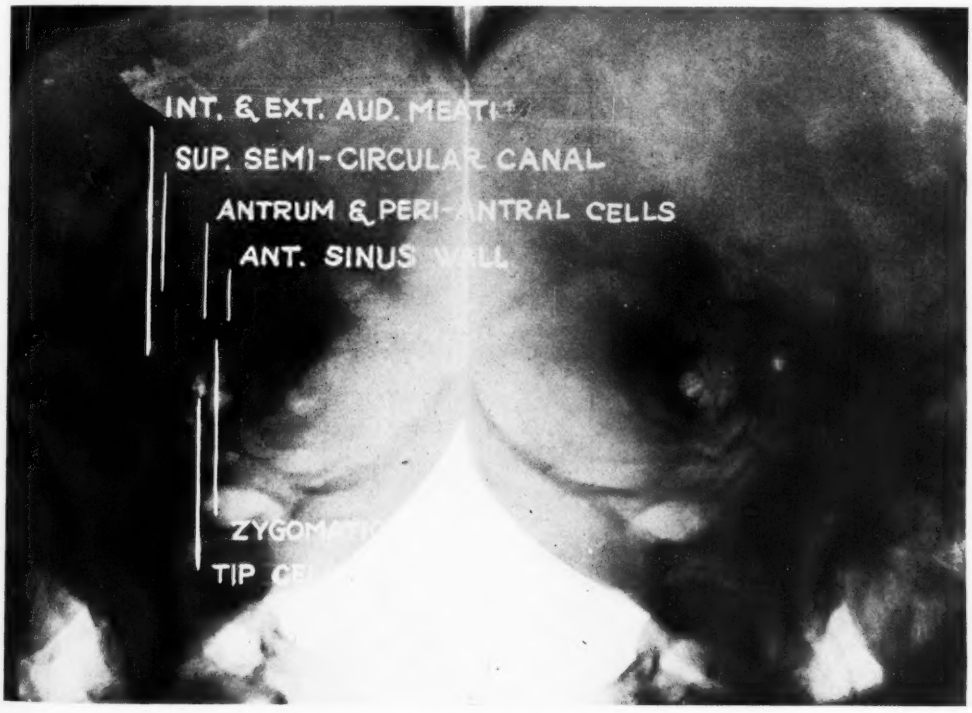


Fig. 10. Radiograph of the mastoid regions of a head, made in the Law Position, showing the shadow landmarks.

Fig. 11. Granger Mastoid Localizer with wooden block to fix the upper jaw and nose, the inclined support for the head as shown in Figures 12 and 13, in position on a properly placed 13 angle block to make a radiograph of the mastoid in the Arcelin Position.

had already found so valuable in our sinus work (6). This was done by adding a vertical sheet of metal with a U-shaped opening to the open end of my mastoid board, and placing within the U-shaped opening an adjustable slide of fiber (Fig. 6).

The simplified technic for making radiographs of the mastoids in the Law position consists in—

(1) Placing between the cassette covered with the mastoid board and one end of the radiographic table two 13° angle blocks, one inclined towards the opposite end of the table, the other towards one side of the table (Fig. 7);

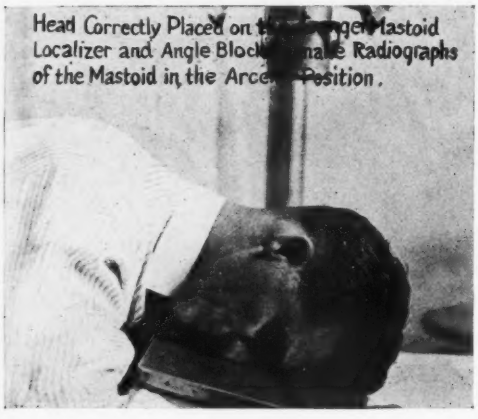


Fig. 12.

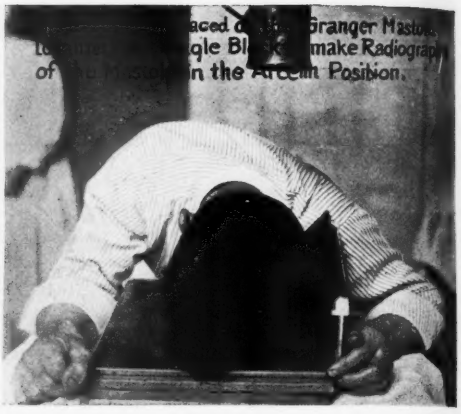


Fig. 13.

(2) The patient lies prone on the table, one arm and hand alongside his body, the other hand on the side of the angle blocks (Fig. 8);

(3) With the pinna held forward, one mastoid region is placed on the cassette (the other half of the cassette is protected by the leaded half of the mastoid board), the nose resting firmly on the adjustable fiber slide, the septum and alveola pressed firmly against one side of the U-shaped opening in the vertical portion of the mastoid board, the glabella and the supra-orbital region against the other side (Fig. 9);

(4) The tube is focussed so that the central ray is directed towards the mastoid region in contact with the cassette.

The same procedure is then repeated to make the other mastoid on the unexposed

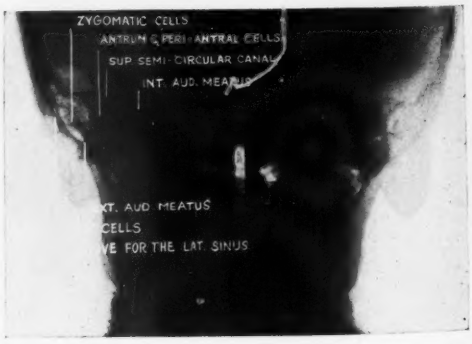


Fig. 14. Radiograph of the mastoid regions of a head made in the Arcelin Position, showing the shadow landmarks.

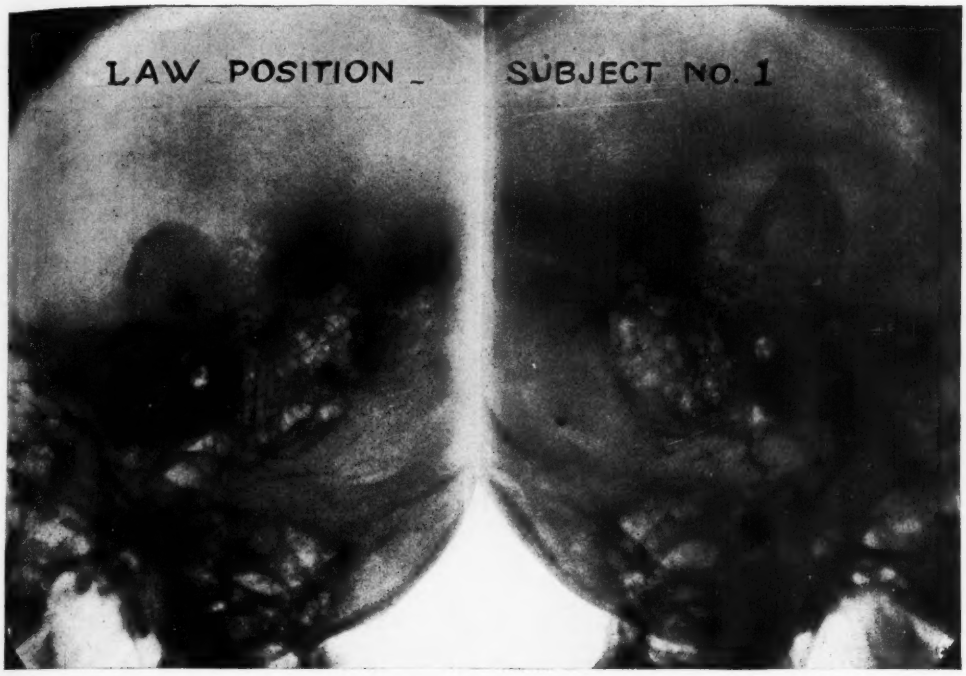


Fig. 15. First radiograph of Subject No. 1 to illustrate the uniformity obtainable with the author's technic.

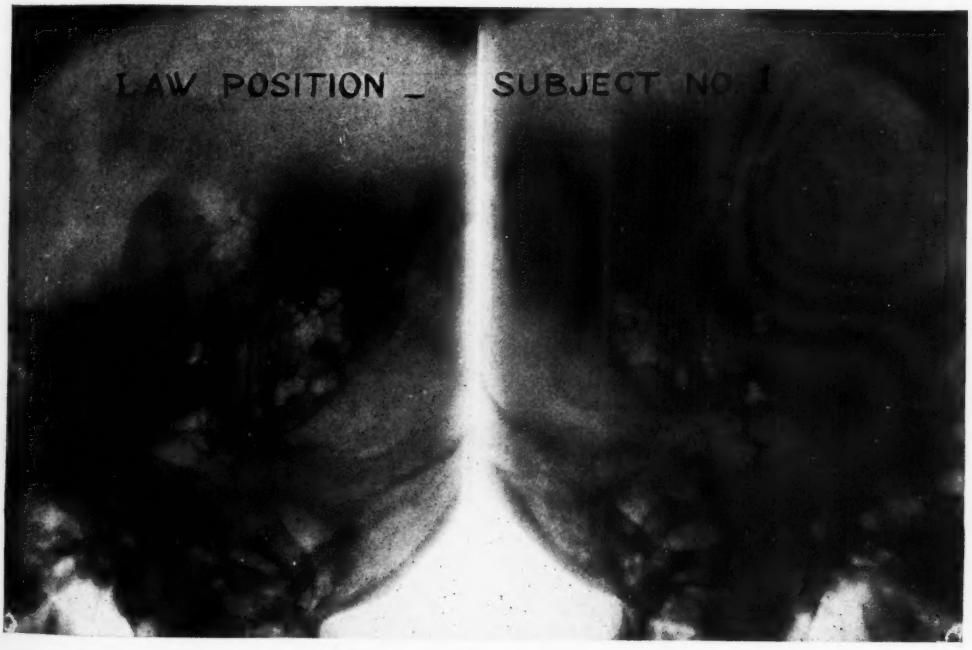


Fig. 16. Second radiograph of Subject No. 1 to illustrate the duplication possible with the author's technic.

Fig. 17. First radiograph of Subject No. 2 to illustrate the uniformity obtainable with the author's technic.

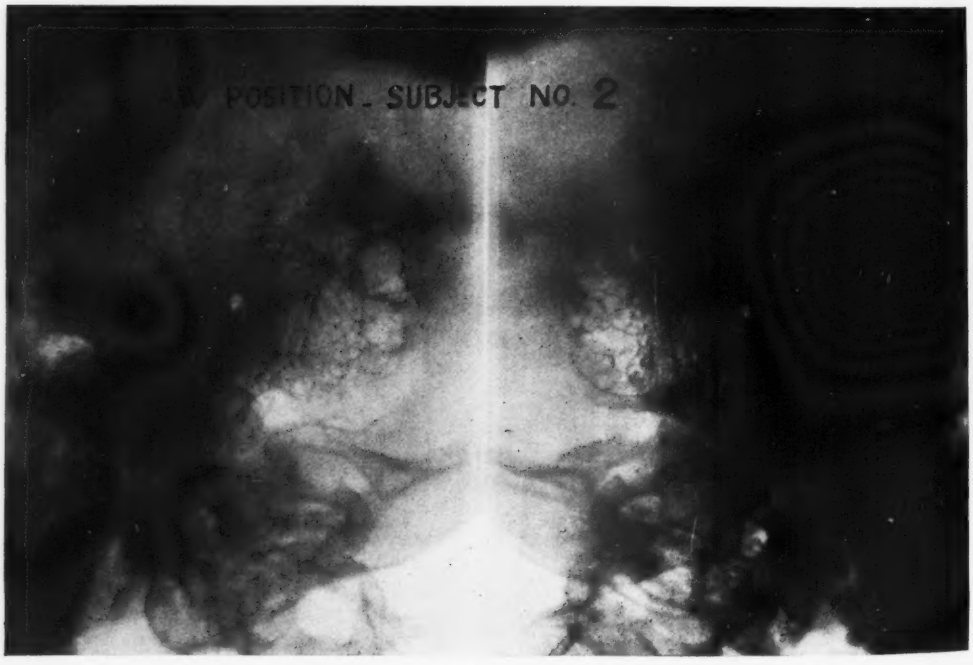


Fig. 18. Second radiograph of Subject No. 2 to illustrate the duplication possible with the author's technic.

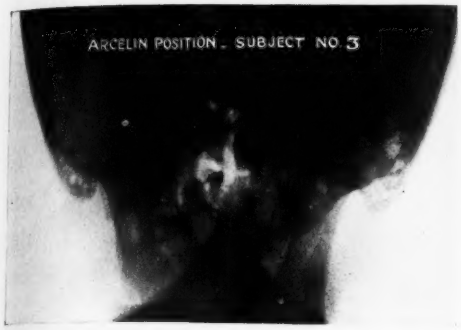


Fig. 19. First radiograph of Subject No. 3 to illustrate the uniformity obtainable with the author's technic.

portion of the film. The entire operation requires much less time than formerly and the result is most satisfactory (Fig. 10).

The simplified technic for making radiographs of the mastoids in the Arcelin position consists in—

(1) Placing a cassette covered with the mastoid board to the vertical portion of which a small shelf has been previously attached on a 13° angle block inclined towards the end of the radiographic table on which it lies (Fig. 11);

(2) The patient lies prone, supported on the elbows, with the half of the forehead on the side to be rayed in contact with the cassette (Fig. 12), the chin resting on a small pad one inch thick and the occiput inclined towards the small shelf of the mastoid board until the free edge of the pinna rests against it (Fig. 13).

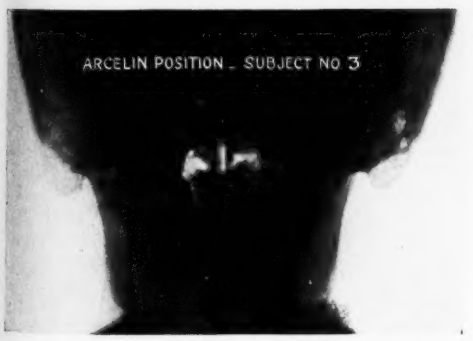


Fig. 20. Second radiograph of Subject No. 3 to illustrate the duplication possible with the author's technic.

Fig. 21. First radiograph of Subject No. 4 to illustrate the uniformity obtainable with the author's technic.

This gives the approximate 50° rotation of the head found necessary by Arcelin to cause the superior border of the petrous portion of the temporal bone to lie parallel to the cassette.

The other mastoid is taken in the same manner on the unexposed portion of the film.

Figure 14 shows the very satisfactory and uniform result obtained, again in much less time and with less trouble than formerly.

To convince myself that the mastoid board and the simplified technic had a real and practical value and that every radiologist who would employ them with average care and attention could confidently expect to obtain just as satisfactory results, I explained the technic and the use of the mas-

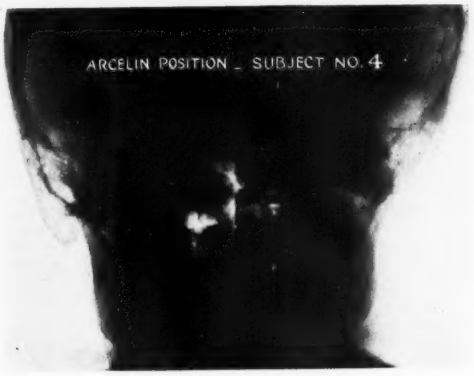


Fig. 22. Second radiograph of Subject No. 4 to illustrate the duplication possible with the author's technic.

toid board to my technician at the Charity Hospital and instructed him to make four mastoid radiographs in the Law position, two each of two subjects, and later to make four mastoid radiographs in the Arcelin position, two each of two other subjects.

He succeeded even beyond my expectations, for I believe that you will agree with me that the radiographs reproduced as Figures 15 and 16, 17 and 18, 19 and 20, and 21 and 22 show a uniformity and duplication as nearly perfect as could be desired.

BIBLIOGRAPHY

1. Law, F. M.: Am. Jour. Roentgenol., Aug., 1917, p. 398.
2. Lange, S.: Laryngoscope, 1910, XX, 437.
3. Arcelin, F.: Rapport Mensuel des Services d'Electroradiologie de la XIVe Region, Decembre, 1916.
4. Gaillard, Rene: Thesis. Gaston Doin, Paris, 1923, p. 38.
5. Law, F. M.: Mastoids. Annals of Roentgenology, 1920, I, 32.
6. Granger, Amedee: Jour. A. M. A., Oct. 20, 1923, p. 1336.

Experimental sarcoma.—In previous communications the authors have reported the experimental production of sarcoma of the liver of rats through the mediation of *Cysticercus fasciolaris*. The rats were infected with the *Cysticercus* by feeding them cat feces containing the eggs of this tapeworm. In this paper, the authors present a study of the cyst wall, beginning with the earliest reactions about the parasite, after it enters the liver, and culminating in the malignant transformation of the cyst wall.

The distinction between benign cysts and malignant cysts is generally sharp, though there are all gradations between benign hyperplasias and the definite sarcomata, and it is at times impossible to differentiate between the two conditions.

Solomon Fineman, M.D.

A Study of the Reactions of the Tissues of the Rat's Liver to the Larvæ of Tenia Crassicollis and the Histogenesis of Cysticercus Sarcoma. F. D. Bullock and M. R. Curtis. Jour. Cancer Res., Dec., 1924, p. 446.

Pulsation in lower right cervical region.—In women with marked hypertension, a pronounced pulsation is often encountered in the lower right cervical region beneath the sternomastoid muscle. This pulsation is due to kinking or buckling of the right carotid artery, caused by the adjustment of a lengthened carotid artery to the decreased distance from the aorta (which is elevated) to the skull. Because of the protrusions of the angle of the carotid from the margins of the muscles, the soft tissues of the neck participate in the pulsations. The mere knowledge of the existence of such pulsations, and an appreciation of the mechanism whereby they are produced, will facilitate recognition and diagnosis of the condition.

W. W. Wasson, M.D.

Right-sided Carotid Pulsations in Cases of Severe Hypertension. George E. Brown and Leonard G. Rowntree. Jour. A. M. A., April 4, 1925, p. 1016.

RADIO-ACTIVE SUBSTANCES AND THEIR THERAPEUTIC USES AND APPLICATIONS

RADIOTHERAPY OF BLADDER TUMORS

By JOSEPH MUIR, M.D., New York

IN the treatment of no form of neoplastic growth has radium more certainly proved its efficacy than in that of bladder tumors. Less than five years ago the outlook for any patient demonstrated to be suffering from a malignant lesion of the bladder was a gloomy one indeed. Fulguration had proved most effectual in dealing with benign papillomata and other non-malignant conditions, but as many of these carcinomatous growths arise in the region of the trigonum, it is impossible to obliterate them with the high-frequency current, and the results of surgery have been in most cases very disappointing.

In 1922 Lower recorded a mortality rate of 51.2 per cent within the first year after resection in 81 cases. In an analysis of the material of the Mayo Clinic, Scholl discovered that 33.6 per cent of 71 patients with malignant papilloma of the bladder died within a year after operation, and that over 71 per cent of 94 patients with solid carcinoma were dead within seven and one-half months after operation.

While there are a few tumors of the bladder which are comparatively easy to excise, the majority offer a very poor prognosis. Those arising in the region of the trigonum are usually the solid rather than the papillomatous type, and "small infiltrating wedges of actually malignant cells, which project down through the muscle bundles, are often cut across when a portion of the bladder wall is excised." It is impossible to eliminate all the cells and those thus remaining quickly proliferate, so that shortly after the operation a growth more formidable than the original one will be in evidence. It thus becomes essential, in order to make surgery effective, that some adjuvant be employed to render any remaining malignancy innocuous.

In an effort to reduce the distressingly high rate of mortality following surgery, attempts were early made to combine radium with it, and later surgery was, in a considerable number of cases, wholly abandoned, reliance being placed on radium alone. There is now in existence a considerable body of literature dealing with these different applications of radium to vesical malignancy, and enough has been done to make possible some comparison of the various procedures by which it has been applied.

How effective even the crude early methods of the vesical application of radium could prove under suitable conditions, is shown by a report made two years ago of a case where radium treatment had been given as far back as 1915. "Two hundred and thirty millicuries of radium emanation in a brass tube 1 cm. long and having walls 1 mm. thick, was placed in the end of a silver catheter and held directly against the tumor for fifteen minutes. The application was difficult; and following it there was, for a number of days, increased bleeding, pain and frequency. On account of the unfavorable effects of this treatment it was decided to treat transabdominally. The tumor lay favorably for this kind of treatment, about one and a half inches beneath the skin surface. The radium in the form of emanation in many 1 mm.-thick brass tubes, 1 cm. long, was distributed in a three and a half inch square lead box, 2 mm. thick. This was covered with rubber and placed on a block of gauze two and a half inches thick for the first five treatments, while in the fifth a distance of four and a half inches was employed." A total of 53,824 millicurie hours, in five treatments extending over a time period of eight months, was given, and at the end of a year and a half there were no symptoms to be observed in the vesical region. Seven years after the last treatment the patient was to all appear-

ances—cystoscopy being refused—in perfect health.

There has been a good deal of hesitation about applying radium to tumors of the deep and relatively inaccessible structures, such as the stomach and bladder, so that long after its employment in dermatology and many gynecologic conditions had become a commonplace, it was not used at all in combating the ravages of vesical malignancy. In 1920, Janeway published reports of the employment of buried radium emanation in the rectum, and in the same year, Lewis, Woolston and others told of methods by which they had applied radium to the treatment of bladder tumors.

The technic used by Kelly at this time for treatment of the female bladder consisted either in the application of radium element directly to the infiltrated vesical wall—with or without a "cross-fire" application of a half-gram of radium held at a fourth-inch or half-inch distance from the vaginal wall for from one-half to two hours —or the implantation of capillary glass tubes containing 5 millicuries of radium emanation directly into the vesical growth. "A fine capillary glass tube is placed in the end of a sterile hollow needle for introduction into the malignant growth. The needle . . . is plunged directly into the tissues and the glass point or spicule is then dislodged with an obturator or stylet of wire, and the hollow needle carrier is withdrawn, completing the little operation. . . . A little sterile vaseline in the needle point prevents the contained point slipping out accidentally."

More recently we have learned something of the methods employed by these same workers in dealing with carcinoma of the male subject. The implement originally designed by Lewis for implantation of bare tubes of radium emanation in female bladders has been modified by Neill so as to be applicable for use with male patients. A surface applicator is also used, containing 1,000 millicuries, so that the equivalent of 100 milligram hours' radiation for each square centimeter of diseased tissue can be obtained by holding the applicator for a period of only six minutes on each area. "In this way a tumor with a surface of 9 sq. cm. would receive a maximum dosage in a total of 54 minutes. By using a stronger applicator, the actual time of exposure can be further reduced. The entire treatment is finished in one or two exposures, extending over a period of from two to three days. This amount of surface irradiation should not be repeated within six weeks."

Direct implantation through the cystoscope is also practised at the Mt. Sinai Hospital, New York, small capillary tubes containing 0.5 millicurie being considered capable of destroying 1 c.c. of tumor tissue. "With a number of introducing instruments prepared beforehand," from ten to fifteen of these tubes can be "quickly and accurately" introduced throughout all parts of the growth, "the entire time consumed being about five minutes. . . . An intensive treatment such as this should not be repeated until a period of two months has elapsed." This same method of treating bladder tumors has also been introduced at the Johns Hopkins Hospital. The application of radium to malignancy of this viscus was made at this institution soon after this therapeutic agent was first introduced into the United States, and a number of instruments were devised here for introducing the radium and holding it in place the desired length of time. Clumsy as these devices now seem, they yet did good service before more exact and easily applied methods had been invented. "The technic employed has been to apply a tube of 100 mgrs. of radium by means of the appropriate instrument, every day or two, to a different portion of the tumor, for a period of one hour, during which time it was held in place by the fixation clamp fastened to the table. After several radium treatments, fulguration was given intermittently with the radium, in large tumors, each being used 8 or 10 times, and the radium occasionally afterward—as much as 1,700 milligram hours." It has been found that

vigorous treatment with radium (100 mgrs.), applied accurately by a Young cystoscopic applicator and fixed *in situ* by a clamp, followed by fulguration, gives results far superior to fulguration alone in benign papillomata; also in the majority of papillary carcinomata, "but that in the infiltrating carcinomata this form of treatment is useless, and time should not be wasted in attempting it."

From one hundred to five hundred milligram hours (5 to 10 hours with a 100 mgr. capsule of radium) was the dosage in the successful cases, while in most of the unsuccessful ones the patients received less than 500 milligram hours. Radium emanation has not been much used at Johns Hopkins and the results of these few cases were not encouraging. One patient who had four small vesical tumors, less than 1 cm. in diameter and not infiltrating, was treated by eight emanation tubes, containing 2¾ mc. each, placed 1 cm. apart, "with distressing results." Shortly after the application the patient began to suffer excruciating pain in the bladder, which persisted for months, regardless of a subsequent suprapubic excision of a large area of necrotic tissue at the site of implantation. Death resulted six months later from metastases. The conclusion drawn from this case was that it "showed the danger of inserting emanation points of more than one-half to one millicurie."

At the Collis P. Huntington Memorial Hospital in Boston, bare radium emanation tubes have been used in the treatment of vesical carcinoma since November, 1919. "Seeds" containing one or two millicuries or 5 mgm. needles are implanted about 1 cm. apart in a tumor, the result of this treatment being to totally devitalize the intervening tissue, converting it into a white fibrous slough. "This slough begins to become apparent within a fortnight: in two months it is well developed. More or less infection supervenes; the amount of infection varies with the individual. In several of the cases at this hospital it was the cause of death, six or seven weeks after the implantation." For this reason, when the growth is too extensive or too deeply infiltrating to be destroyed by one or two seeds, the practice has been adopted of opening the bladder and cauterizing the growth down to the level of the surrounding bladder surface, after which seeds are implanted "by means of straight hollow needles furnished with stylets. A row of seeds is implanted about the periphery about 1 mm. inside the edge of palpable induration, and about 1 cm. apart. A few more are implanted in the center of the growth." The problem in treating cancer of the bladder by this method, as these workers see it, has been tersely expressed by George Gilbert Smith as being "to use enough radium to destroy the cancer, but not enough to destroy the patient."

At the Mayo Clinic radium has been employed extensively in the therapy of bladder tumors, not only as the sole method of treatment, intravesically and with cystostomy, but also in conjunction with cauterization and surgery. Cystoscopically, several methods of application are available; in some, a tube of radium salt was applied directly to the growth; in others, radium-bearing needles were implanted in it, and in many, emanation-filled seeds, containing usually in the neighborhood of one millicurie, were implanted at approximately 1 cm. intervals. Of 34 patients treated by radium alone, five died immediately following treatment, or as the result of it a few weeks later. "This mortality of 14.70 per cent," remarks Bumpus, "illustrates that the application of radium is not without grave risk, and therefore should not be employed unless there is very definite evidence of possible benefit; for if a sufficient dose is given to destroy the growth, toxic absorption will result and the patient with poor renal function will succumb. To give a smaller amount seems irrational, and to give repeated doses invites sloughs and fecal fistulas, since, after the first dose, the endarteritis that is produced, together with the fibrosis, renders the area vascular and greatly enhances the chance of fistula formation. Delay also gives opportunity for the development of further malignancy. These patients re-

ceived an average of approximately 2,000 milligram hours, varying according to the size of the growth. Of the 19 patients treated, 13 are dead; 6 are living, none over three years. The average duration of life from the onset of the disease to the death of the patient was 2.86 years, approximately the same as though no form of treatment had been used."

It was the observation at this clinic that radium, given in connection with operation or immediately following it, did not increase the mortality rate, and seemed definitely to lessen the percentage of recurrences. Approximately one-fourth of the patients so treated have lived more than four years after operation, a fact which "shows the value of radium applied in this manner as an adjunct to surgery."

Pre-operative radium-emanation treatment has been extensively carried out at this clinic, although all the workers do not seem to be agreed as to its value. The "flat infiltrating tumors which readily recur" are considered the type most suitable for pre-operative radiation. "Small amounts of the element are used with the idea not of completely destroying the growth, but of diminishing the capacity of the cell for proliferation. This is done in an attempt to inhibit early recurrences from segments not removed and to prevent reimplantation of cells freed during the excision of the tumor." The radium emanation is implanted by placing a direct vision cystoscope so that the basal opening is on the tumor and the water has free exit. Contraction of the bladder following its evacuation draws the tumor firmly against the open end of the instrument and holds it in place until the point of the radium needle can be inserted and the tube driven into the growth. The bladder is then refilled with water and a second area of the tumor localized. This procedure is repeated until the tubes of radium emanation have been studded through the growth. Tubes of about one millicurie strength are usually distributed on an average of one to every square centimeter of tumor tissue.

The most encouraging reports of the radium treatment of bladder tumors found in recent literature are undoubtedly those from the Memorial Hospital in New York City. Both the intravesical and the suprapubic routes are used. The first is taken to approach growths confined to the bladder neck or very close around it; or, if the pedicle is accessible, to pediculated papillary carcinomata, and also to infiltrating sessile growths not larger than 2 cm. in diameter. If the vesical wall is extensively infiltrated and the tumors are large and multiple, the suprapubic route is preferred.

The intravesical method consists in passing a flexible spring holder through the cystoscope by which one hundred or more millicuries of unscreened radium are held up against the tumor for a period of half an hour, while the tumor is being observed through the cystoscope, this treatment being repeated every two weeks. In addition, in the presence of marked induration, a radium needle, the steel of which serves as a screen, is thrust into the indurated area. "Needles from 50 to 200 may be used for a period of time up to forty minutes. Again, small bare tubes of 0.5 millicurie of radium emanation to a square centimeter of tumor tissue, are implanted in the base of the tumor and left there. In extensive growths, the treatment is sometimes begun by placing in the bladder two tubes of screened radium (0.6 mm. silver, 2 mm. rubber) inserted through the sheath of a straight cystoscope, tied with a string and left in place for varying periods of hours —usually two tubes of 50 mc. for five or six hours."

When it is necessary to apply the radium suprapubically, the tumor is exposed and any protruding portions snared off so as to make it practicable to treat the base. Areas of induration are then implanted with bare 0.5 mc. tubes of radium emanation by means of a needle, using two of these to the square centimeter, and implanting close to the edge of the carcinomatous area. Finally, surface radiation is accomplished by means of tubes of radium emanation screened by 0.6 mm. of silver and 2 mm.

of rubber placed on the surface of the tumor and held in place either by gauze packing, or little hooks on the silver tubes. A space 2 to 2½ c.c. in diameter is radiated by two of these tubes, placed longitudinally side by side, 1 cm. apart. To such an area 500 or 600 mc. hours is given.

Though the Memorial Hospital report appeared three years ago, the results obtained after their radium work are apparently the best which have followed any of the methods which have just been outlined. To any enthusiastic believer in the efficacy of radium as a cure for vesical malignancy this review cannot fail to prove disheartening. To what must we attribute this high percentage of failure and disappointment, which is only too evident, even after every allowance has been made for the advanced stage at which most of these neoplasms are placed in the hands of the radiologist? Apparently the answer to this question is contained in the observation made by Edwin Beer, the distinguished urologist, in 1923, when he said that he believed bladder tumors "that are definitely removable by operation should still have the chance of cure that surgery offers, as the radium treatment must of necessity be a hit-or-miss procedure in view of the fact that the operator who introduces the emanation needles either transurethrally or through an opening in the bladder made by suprapubic incision, does not know at the time of the introduction of his needles how wide an area should be radiated, or how deeply the needle should be embedded." It is just this "hit-or-miss" character of radiation that is largely at fault.

When a tube of radium or its emanation is embedded in cancerous tissue, after a certain length of time has elapsed there will be a zone of necrosis about that tube. Outside the zone of necrosis is another zone of tissue—perhaps one or two centimeters in diameter—where one can observe congestion of the capillaries and a notable swelling of the epithelial cells. Investigation further will show that this swelling is due to edema of the cell protoplasm which is markedly vacuolated, while the nuclei show not only division by simple cleavage, but also karyorrhexis, with deficiency of chromatin. The entire area is infiltrated by lymphocytes and leukocytes, while surrounding the outside is an infiltration of fibroblasts. In some of the earlier papers of this series it has already been mentioned that this necrosis is the result of the action of the beta rays, and, to a certain extent, the gamma rays also; the outer fibrosis is produced by the gamma rays alone. It is the effect of this necrosis which introduces the great element of danger into any form of radium treatment, and a careful consideration of the usual methods of irradiation will, I think, give a clue to the chief reason for non-success in the treatment of bladder tumors. In most instances the tubes used have been too large, thus concentrating the radiation at a few points, instead of widely distributing very small units. Where such small units were occasionally used, the technic of implantation was defective, so that they were not placed to the best advantage. Often, too, the instruments were clumsy and inefficient, requiring much time and many manipulations before even a small growth could be sufficiently irradiated. Often, no doubt—though of this we have no means of judging—the technical part of the treatment has been in inexperienced and, therefore, unskillful hands.

The radiation of bladder tumors should not be undertaken by any one except a skilled cystoscopist, and by him only when he is equipped with the essential special knowledge of radium technic and provided with efficient instruments for making the implantations. Given these conditions, the whole procedure becomes simple for the operator, and as safe for the patient as any known method of treating vesical malignancy.

The method employed by the author, while corresponding in a general way to that used at the Memorial Hospital and the Huntington in Boston, has two all-important features—the use of very minute quantities of radium emanation, and the exact locating

of every container which is placed in the neoplastic area. The first does away with the production of extensive necrosis about the tubes, and the second assures sufficient irradiation of the entire growth. The "hit-or-miss" method is thus abolished. The strength of the capillary tubes employed is never greater than one millicurie, usually no more than 0.5 millicurie, and often as little as 0.1 millicurie. The "seeds" used can be applied through any cystoscope if the vesical neoplasm is a small one; or, if we have to deal with large growths, a cystostomy can be done which permits of implantation under direct vision, and also takes care of the very important item of drainage during the subsequent disintegration of the tumor.

The instrument used to apply the radium emanation "seeds" through the natural channel differs from the needles which have been described in the preceding paragraphs in that it has a loading slot at its proximal end, and by this simple addition does away with the greater part of the vexations commonly attendant upon the implantation procedure. There is no need to "gum" the capillary tube in place with vaseline, nor to withdraw the instrument after each seed has been placed; no need of filling and emptying the bladder with water, or of the production of trauma by continuous "punching" of the diseased tissue in order to place additional points. The needle can be inserted at any desired spot in the growth, and—always under direct vision—the seeds may be placed one after another at exactly spaced intervals, simply by withdrawing the point a definite distance —usually a half-centimeter—and pushing up another seed from the loading slot by means of the obturator. A nurse or assistant places the seeds in the chamber so that the operator's whole attention may be centered upon the exact spacing of the radioactive substance. Local blocking, or, better still, sacral anesthesia, is all that is required to make the patient comfortable, for even a large growth can be so quickly implanted by this technic that the procedure is well borne even by much debilitated subjects.

In small growths, the entire amount of radium emanation can be given at one time; larger tumors may require two or even three treatments. Great care must always be exercised not to damage the vesical sphincter, and if the growth is near that area, allowance must be made for the inflammatory reaction which follows the use of even the minutest quantity of a radioactive agent. If it is necessary to give more than one treatment, the second implantation must be deferred until the bladder irritability and other manifestations of this inflammatory reaction have disappeared—usually three or four weeks must be allowed to elapse. In certain types of larger growths it may be advisable to reinforce the radiation from the buried emanation by a high intensity radium emanation applicator, used directly upon the surface.

The object of this treatment—as of every type of radium therapy—is "to employ and support Nature's method of healing." Though we do not as yet understand the principle by which radium obtains its effects, we are able to comprehend that destruction by fibrosis is much to be preferred to that by necrosis, and to reduce this necrotic process to its lowest possible terms is the chief aim of the procedure. To do this in the simplest manner possible, without resort to cumbersome instruments, which keep the patient immobilized for long periods and necessitate his remaining in hospital with great loss of time and expenditure of strength and money, is a less important aim, but still one that, if attained, adds not a little to the value and efficiency of the treatment. Moreover, a point not to be lightly disregarded is the minimum amount of trauma which the special implantation instrument causes, which greatly lessens the danger of dissemination of the cancer cells, a matter of especial importance in dealing with vesical neoplasms. The careful distribution of small amounts of the radioactive substance reduces the amount of necrosis which must take place, and thus limits the systemic toxemia that so frequently followed the older methods, with grave and even fatal effects. Finally, it converts what

has heretofore been a lengthy major intervention into a procedure hardly more serious than a simple cystoscopy, and would seem to hold out the hope that in the future, much of the terror which the knowledge that he is suffering from a vesical neoplasm now usually inspires in the mind of the average patient, may be proved to be wholly unfounded.

The technic to be followed in a suprapubic cystotomy will be the subject for a subsequent paper.

REFERENCES

1. Barringer, B. S.: Radium treatment of carcinoma of the bladder. Ann. Surg., 74:751, 1921.
2. Beer, Edwin: Tumors of the bladder. Surg. Clinics North America, 3: No. 2, p. 423, April, 1923.
3. Bumpus, H. C., Jr.: Modern methods and results of treating malignancy of the bladder. Jour. A. M. A., 83:1139, Oct. 14, 1924.
4. Daland, E. N.: The A B C of radium. Boston Med. and Surg. Jour., 184:696, June 30, 1921.
5. Ewing, James: An analysis of radiation therapy and cancer. The Mutter Lecture, Trans. Coll. Phys., Phila., 1923.
6. Hyman, A.: The intravesical (cystoscopic) treatment of carcinoma of the bladder by implantation of radium emanation. Surg., Gynec. and Obst., 39:827, 1924.
7. Janeway, H. H.: Effect of buried tubes of radium emanation upon normal and neoplastic tissue. Am. Jour. Roentgenol. and Rad. Ther., 6:92, Feb., 1920.
8. Kelly, H. A., and Lewis, R. M.: The treatment with radium of cancer of the bladder. Surg., Gynec. and Obst., 31:303, 1920.
9. Lewis, R. M.: Apparatus for implantation of radium emanation points. Surg., Gynec. and Obst., 30:528, May, 1920.
10. Muir, Joseph: Advantages of the loading slot in radium emanation implantation, Jour. of Urol., XI, Mar., 1924.
11. Neill, William, Jr.: Radium in treatment of new-growths of the male bladder. Jour. A. M. A., 79:2061, Dec. 16, 1923.
12. Scholl, Albert J., and Braasch, W. F.: Preoperative treatment of malignant tumors of the bladder by radium. Arch. Surg., 5:334, Sept., 1922.
13. Smith, George Gilbert: The treatment of cancer of the bladder by radium implantation. Jour. of Urol., 9:217, 1923.
14. Woolston, W. H.: An instrument for the application of radium to tumors of the bladder. Surg., Gynec. and Obst., 31:627, Dec., 1920.
15. Young, H. H., and Scott, W. W.: The results obtained by various methods in the treatment of tumors of the bladder. N. Y. Med. Jour., 118:262, Sept., 1923.

Effects of deep therapy.—Following a series of experiments on dogs and observations on patients, the authors conclude that: (1) The phosphorus content of the blood has a definite relation to the dosage of roentgen rays and the tissue radiated; (2) the large increases in phosphorus and decreases of amino acids and non-protein nitrogen during the first hour following irradiation indicates a maximum initial effect upon the cell nucleus; (3) an early distinct alkalosis of the blood is probably brought about by nuclear destruction yielding purine bases; (4) the organism after moderate dosage rapidly returns to normal from this stage, with a compensating mild acidosis in twenty-four hours; (5) this acidosis usually protects the organism against any untoward effects after the second or subsequent treatments; (6) very heavy dosage or irradiation of large tumor masses is followed by gradually intensified alkalosis with lethal termination. Here there is a secondary salt action with widespread cellular destruction of both nucleus and protoplasm, accompanied by high non-protein nitrogen, uric acid and guanidine content of the blood; (7) the effects of irradiation are counteracted by substances which protect the cell, namely, ether anesthesia, morphine, glucose and calcium lactate.

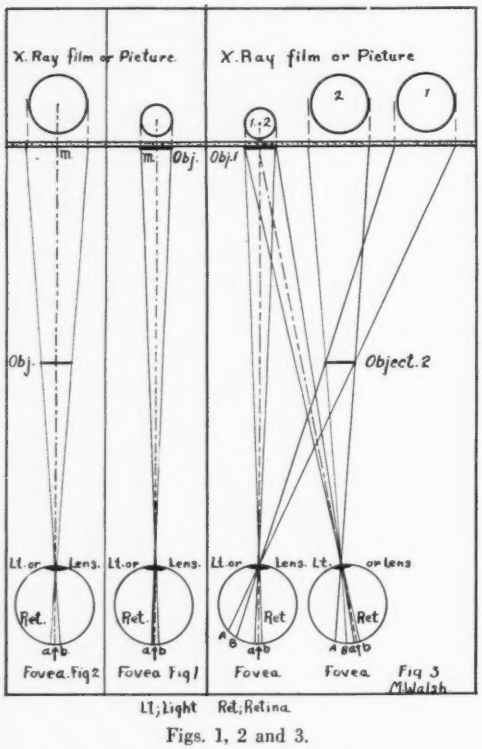
J. D. Camp, M.D.

Immediate Metabolic Disturbances Following Deep Roentgen-ray Therapy. H. P. Doub, A. Bolliger, and F. W. Hartman. Am. Jour. Roentgenol. and Rad. Ther., Jan., 1925, p. 54.

THE PHYSIOLOGY OF A TRUE OPTICAL VIEW BY MEANS OF THE STEREOSCOPIC RADIOGRAPH

By EMIL G. BECK, M.D., F.A.C.S., Surgeon to the North Chicago Hospital, and ELLIOT SMITH, CHICAGO

IN the article on the "Stereoscopic Radiograph as an Aid to the Surgeon," read before the Chicago Medical Society, January, 1911, one of the writers (E. G. B.) stated: "The stereoradiograph overcomes practically all the shortcomings of the single plate. The fusion of the two pictures into one, by means of the stereoscope, builds up a plastic, translucent body resembling a glass model, in which all the



Figs. 1, 2 and 3.

structures can be plainly distinguished. The distortion and magnification of shadows, a fault in single radiographs, due either to oblique exposures or to the distance of the radiographed object from the plate, are corrected in the stereoscopic radiograph, because the latter *produces a true optical view*" and corrects all distortion.

To explain, by psychology, how mere shadow pictures can so produce plastic images, is the purpose of this paper.

Let one begin with the simplest possible example of how a shadowgraph can produce an image corresponding to that of actual observation. Suppose a coin is placed at a unit distance from the observer, who looks at it with one eye only. Such a case is illustrated by Figure 1. The light from the object, as shown by the narrow solid lines, passing through the lens of the eye, produces upon the retina of the eye an inverted and much reduced image of the object. In the figure this image is shown by the heavy line *ab*. The dotted line indicates the course of that light which falls upon the fovea. If now, by placing a sensitized plate directly behind the coin, and by putting a light in the position that was occupied by the lens of the eye, an exposure is made, the shadowgraph produced (shown by the circle labeled "picture" in the figure) will be quite analogous in form and size to the coin. Hence if this shadowgraph be observed at a unit distance from the eye, the image produced on the retina of that eye will correspond exactly with the image of the coin.

Suppose now that the coin be placed at one-half instead of a full unit distance from the eye. This case is illustrated by Figure 2. As the diagram clearly indicates, the effect on the eye is to produce an image twice the size of that produced in Figure 1, with the coin at unit distance. If, as before, the plate be put at a unit distance and a shadowgraph made, this shadowgraph will be a circle of twice the radius of the former shadowgraph which was equal in size to the coin. Hence the image produced by its observation at the unit distance will be twice the size of that produced in Figure 1 and so equal to that produced by observation of the coin at half unit distance. This is really more evident from

the diagram than any description can make it. There will thus be no apparent difference between the coin observed at half unit distance and this second shadowgraph observed at full unit distance. Analogously, at whatever distance the object is placed, if the distance of the plate is the same for both exposure and observation, the shadowgraph will invariably give an accurate image of the coin.

Let us now turn to binocular vision. Before trying to solve the problem of an artificial production of a "true optical view" by shadowgraphs, let us consider the natural process of obtaining it. Taking, for illustration, the observation of two coins, one at full and one at half unit distance from the eyes, let us assume that the eyes focus on the farther coin. (Object 1 in Figure 3.) The images of the center of this object, as the dash lines in the diagram indicate, will fall on the fovea of each eye. In each eye, also, Object 2 will be imaged slightly to the right of the fovea; Figure 3 illustrates this clearly, where the heavy lines *ab* and *AB* in each eye indicate Image 1 and Image 2, respectively. Here, as previously, the images of the nearer coin are the larger. But our minds, in turning the stimuli received from these images on the retinas into perceptions, introduce distance from the eyes, and proportionate size of the objects determined by their distance. We have learned by reaching out and touching objects, by walking up to them, by comparing new distances with those thus discovered, by numberless similar experiences, to associate the different amounts of convergence of the eyes necessary to bring the image of an object simultaneously upon the two foveæ, with definite spacial distances from the observer. The making of this actual convergence even, is soon unnecessary. Objects imaged elsewhere than on the fovea demand convergence or divergence to focus the two foveæ on them, in proportion to the amount of the difference between the distance of the image from the retina in one eye and this distance in the other, that is, in proportion to what we will call the "difference in fovea distances." This physical fact is clearly evident from the diagram. Experience teaches the mind to associate these "differences in fovea distances" with definite amounts of convergence or divergence of the eyes, which is at once interpolated into a perception of actual distance from the observer. Thus in Figure 3 the fovea distance *Ba* in Eye 1, being greater than the fovea distance, *Ba* in Eye 2, the difference is positive, that is, the greater fovea distance is in the eye where the image is on the "outside" of the fovea. Plainly this positive difference indicates a convergence, not a divergence, of the eyes; a shorter, not a greater, distance of the object from the observer. When this difference is negative, the reverse is true. Through the ceaseless practice of daily life these "fovea differences" become very accurate indicators of special distance. In a similar manner, the mind has learned to discount the size of the image in proportion to its distance from the observer. Thus, to return to our illustration, though the two coins cast images of very different sizes on the retinas, they appear as coins of the same size, but at different distances from the observer. This seeing of objects in their actual size and distance is the essence of the "true optical view."

Let us now return to our shadowgraphs. Let us introduce a plate at unit distance, as in the monocular work. By first making a shadowgraph with the light in the position formerly occupied by the lens of Eye 1, and then making another on a new plate, with the light in the position formerly held by the lens of Eye 2, we will obtain two shadowgraphs, each of which, if viewed at unit distance by its proper eye, as our previous exposition has shown, will produce in that eye an image exactly analogous to that which real objects would produce. This can readily be seen from Figure 3. Hence if we can make two successive radiographs with the light first in the one position of one eye and then of the other, and if we can arrange those pictures so that each eye will see only the radiograph proper to

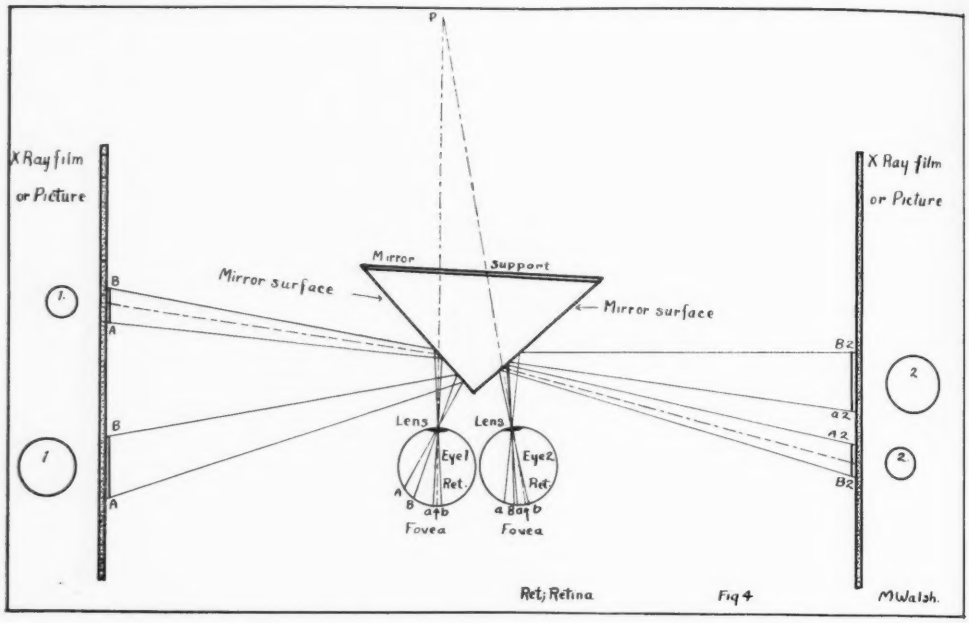


Fig. 4.

it, and yet each eye have the image of the same object on its fovea, we will simultaneously *have produced* images on each of the eyes which are exactly like those produced by the actual objects. The effect consequently must be the production of a "true optical view" with the objects appearing in proportion to their actual size, and with the distance from the eyes clearly observable. To obtain the two required radiographs is simple. The X-ray bulb is placed on a sliding carriage. Without moving the patient and carefully changing the plates so as not to disturb him, two exposures are made, removing the bulb the distance between the eyes, between them. The two plates, when developed, are set facing each other, with a rectangular prism reflector midway between them. The observer then places his eyes close to the intersection of the mirrors forming the prism. This apparatus is illustrated in Figure 4. *A*, *B* and *ab* on the shadowgraphs of the coins, made with the light in the position of Eye 1 of Figure 3 *A2B2* and *A2B2*, are those made with the light in the position of Eye 2 of Figure 3. As shown by the narrow solid lines in Figure 4, the light coming from the shadowgraphs is bent by the mirrors so that each eye receives the light from its proper plate as if it had come from somewhere very nearly in front of the observer. Considering only one eye by slightly altering the angle of the prism or the direction of the eye, any desired image can be brought upon the fovea. Let us assume again that one image of the center of the small coin is so placed. This is indicated by the dash line in the figure. The amount of convergence or divergence that the other eye will have to undergo, in order to bring the corresponding image on its fovea, is determined, it is plain, by the position of the mirror-prism in regard to the plates, the farther back it is moved from the line joining the centers of the two plates, the greater will be the convergence, and the farther forward the greater the divergence. If it is brought so far forward as to demand a divergence, the eyes will not respond and we will get no fusion of the two images. By a very slight motion of the mirror back-

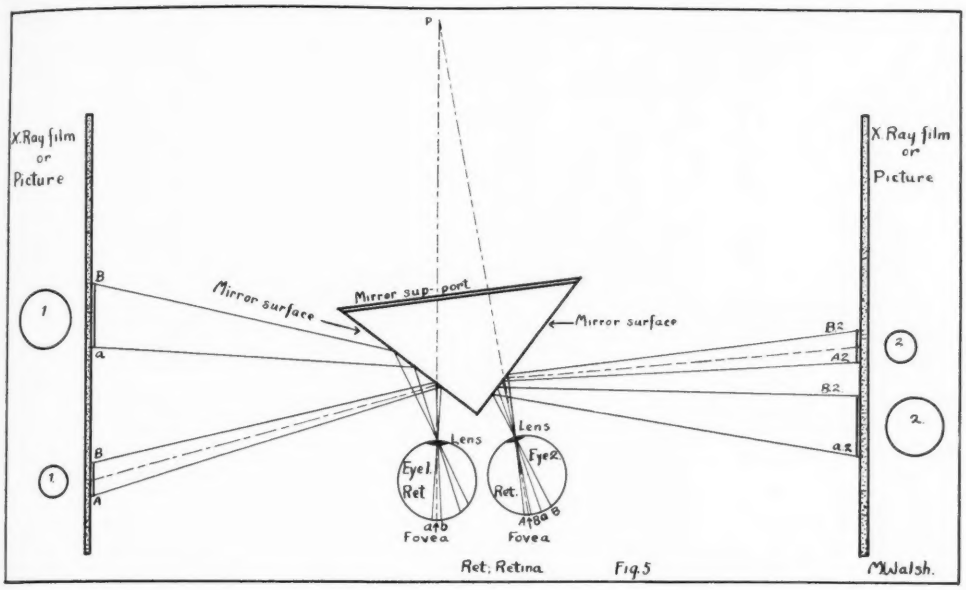


Fig. 5.

wards and forwards across the line joining the centers of the plates, we can produce an angle of convergence that will cause the object to appear to be a few feet from the observer. With this constant apparent distance, the apparent size of the object, since it varies in proportion to the size of the image cast on the retina, will vary inversely as the distance the light must travel from the plate to the observer. This is evident from the discussion of monocular vision.

Granting these technical adjustments, it is plain that we have satisfied the requirements laid down before, as necessary to produce images on the retinas of the eyes exactly like those produced by actual vision and have hence produced "true optical view." To illustrate this, we have drawn Figure 4 to the same scale as Figure 3 and have arranged the apparatus so that the angle of convergence of the eyes is the same in both cases. In this case, as can be seen at a glance, the images on the retina in Figure 4 are the same as those corresponding in Figure 3, not only in proportions, but also in absolute measurement. The potential convergence necessary in turning the foveæ from the far object to the near is in both figures measured by the difference between the areas *AB*, Eye 1, and *AB*, Eye 2. In both cases this difference of fovea distance is the same. The near object will appear the same distance in front of the far one, and of the same proportional size.

Thus we artificially produce a true optical view, a view characterized by seeing things in proportion to their actual size and arranged according to a third dimension.

One point, however, must not be forgotten, namely, that the plates must be properly placed before inspection. The pictures must be viewed in the same position in which they were taken. In other words, if a body was taken dorso-ventrally, it must be viewed dorso-ventrally, otherwise we obtain a false or pseudoscopic view. It makes quite a difference whether we put our plates into the stereoscope with the film or the glossy side towards the mirror. It also makes a great deal of difference which film is placed to our right and which to our left. The two exposures, which are made with the shifting of the focus of the tube,

should represent our two eyes. Plate Number 1 represents the left eye, Plate Number 2 the right eye, and thus they should be placed in the stereoscope in such position that when reflected upon the mirror the left eye will see Plate Number 1 and the right eye will see Plate Number 2. It is therefore necessary to number the films when they are taken. Otherwise what should appear near would appear remote and *vice versa.*

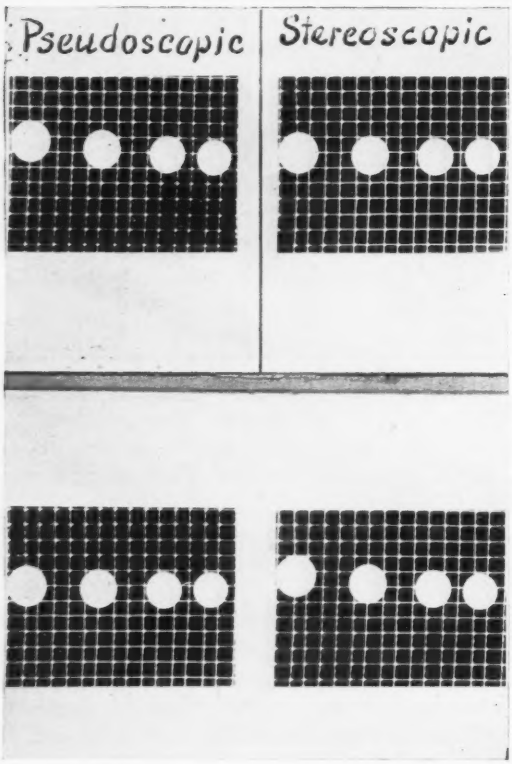


Fig. 6, Stereo I. Coin experiment showing difference between stereoscopic and pseudoscopic views through shifting of films.

Objects which appear at a distance are also greatly magnified. The reason for this is almost self-evident when we compare Figure 5, in which the plates have been turned over, with Figure 4. With the exception of this inversion the situations illustrated by the two figures are quite similar. The result is that the size, retinal distances, etc., of the images correspond in the two cases, but the potential convergence in Figure 5 is negative instead of positive. The excess difference in fovea distance is on the inside of the left side, not the outside. To turn the foveæ toward the "near" object here, requires divergence instead of convergence. The large shadow, instead of appearing nearer, thus appears more remote. Hence its relative size is greatly magnified.

Thus if our radiographs are reversed in position, instead of a true stereoscopic effect, we obtain a pseudoscopic view. We cannot illustrate this better than by showing here again the coin experiment published some eight years ago.

COIN EXPERIMENT SHOWING STEREOSCOPIC AND PSEUDOSCOPIC VIEW

(Stereo I)

A convincing illustration of correction or shadow distortions is seen when this stereo is viewed (Fig. 6). It represents four coins (American half dollars, which, of course, are all the same size) placed side by side on a wire screen, each coin, however, being placed at a different level from the screen, supported at the different heights by various thicknesses of cotton. The first coin lies directly on the wire screen; the second an inch higher; the third two inches, and the fourth three inches above the screen or plate.

Examining a single plate we note that each coin is of a different size, due to the magnifying of the shadow, on account of the various distances of the coins from the sensitive plate. The four coins appear to be lying directly upon the wire screen. In viewing the stereoscopic pair by means of prisms or a hand stereoscope, all four coins return to their normal size, but their relative distances from the screen are at once apparent. They appear in front of the screen, approaching the observer. This then illustrates a *true optical view*, which corrects all the distortions of the single plate. One must, however, take into account that even in the stereoscopic view a certain relative difference in the size of the four coins is to be expected, such as we always observe by looking at two objects of the same size, when one is a little nearer to the observer's eye, and, therefore, must appear a trifle larger.

If the plates are transposed by shifting the right to the left and the left to the right, a *pseudoscopic view* is obtained. The coins ap-

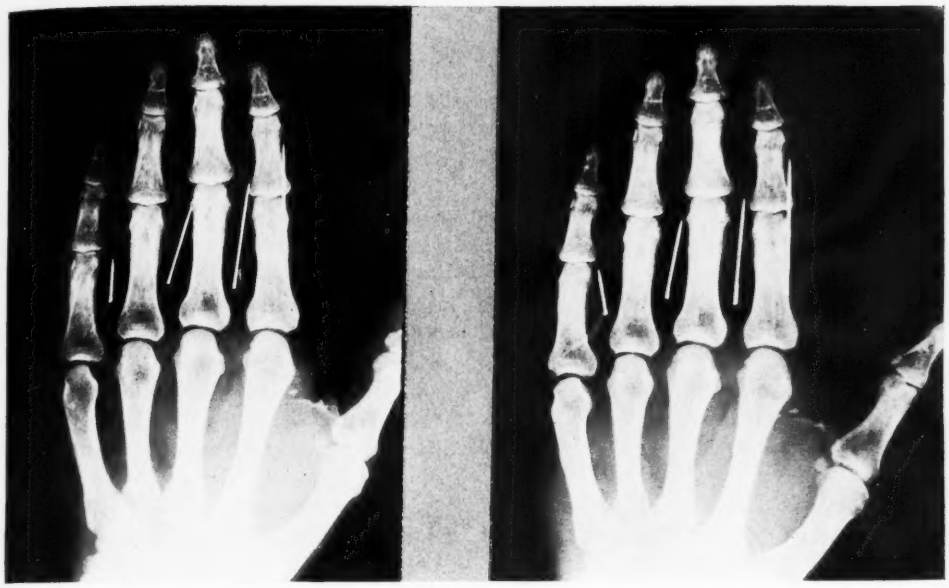


Fig. 7, Stereo II. Experiment with needles to prove that single plates may mislead in estimating size of objects.

pear to be receding from the observer, behind the wire screen, and their shadows, as they recede, subtend greater angles at greater distances and, therefore, are greatly magnified, giving an entirely false image. Of course, in radiograms which do not show much depth, as, for instance, a foot or a hand, this distortion is not noticeable, but in the chest or the pelvis the distortions are so great that they may mislead us in our diagnosis.

This simple experiment teaches a principle which, in its practical application, has a great diagnostic value. If the plates are properly viewed, we will obtain information which from the single plate is often impossible. Take, for instance, the estimation of the length of a needle embedded in the hand. The shadow produced by it in the radiogram is no criterion whatsoever of its actual length. The needle may be many times the length it appears in the picture. The size of the shadow depends entirely upon the angle at which the needle was embedded in the tissues of the hand and its position to the X-ray plate.

We can offer no better illustration of this fact than by reproducing here the stereoroentgenogram of four needles placed at various angles about a hand, published by me (E. G. B.) some years ago in the Stereo Clinic of Kelly.[1]

ESTIMATION OF LENGTH OF NEEDLES

(Stereo II)

Four needles of equal sizes, each one and three-fourths inches in length, are used in the experiment (Fig. 7). Needle Number 1 is placed under the index finger, its full length being in contact with the plate. Needles Number 2, 3 and 4 are placed between the fingers of the hand, each at a different angle, so that the eyes of the needles are in actual contact with the plate, while the points are directed upwards.

The stereoradiogram is now produced. Let us examine one of the single plates. We note that each of the four needles appears to be of different length, the one between the third and fourth fingers appearing to be about one-third its actual size. This illusion is at once dispelled when the stereoscopic card of the radiogram is inspected. All four needles will be seen to be of equal length and their position and relation to the hand surfaces will be clearly demonstrated. The observer will also note that the hand shows very fine lineal furrows and ridges of the

[1] Beck: Stereo Clinic (Kelly). Localization of Foreign Bodies. Published by Southworth Company, Troy, N. Y.

skin, similar to the finger prints used in the Bertillon system, the whole resembling a very fine transparent glove of the entire hand and thus giving the outline of the fleshy part of the same and facilitating the comparison of the relative positions of the needles to the hand. This effect has been produced by rubbing bismuth powder into the skin surface.

The objects radiographed will be represented in the stereoscopic view in their actual relative sizes and not by distorted shadows. We can by this method estimate the actual sizes and lengths of foreign bodies, such as bullets and needles, even if such lie transversely within the tissues of the body. Their actual length may be estimated by comparing their relative shadow size with the objects in which they are lodged, such as bones or other structures.

Stereoscopic radiography has become popular in the last few years because surgeons and radiographers have become convinced that the interpretations from the stereoscopic set are much easier and more reliable than those from the single plate. The magnification of shadows to the loss of their intensity, due to the distance of the objects radiographed, makes, in many instances, the single plate almost worthless. Yes, even less than worthless. It may at times lead to false deductions and consequently to wrong treatment. In the stereoscopic picture we not only obtain the third dimension but we gain a great deal more. The magnification and distortion of the shadows is corrected; overlapping shadows, representing various dense objects in the path of the rays, are separated, so as to give us a clear vision of the correct location and depth.

These experiments and the practical application of the stereoscopic method of diagnosis for the past fifteen years have taught us its advantages, and we wish again to urge its more extensive application.

BOOK REVIEW

INTERNATIONAL CLINICS. Vol. IV, 34th Series, 1924. J. B. Lippincott Company, Philadelphia, 1924.

Volume IV of "International Clinics" contains contributions on interesting subjects from many internationally known men, including Drs. Banting and Ochsner. It includes an exceptionally lucid and forcible chapter on intestinal obstruction by Dr. Bunnell of San Francisco. He points out clearly the cause of death, complications, indications and contra-indications for operation and treatment of ileus. The importance of post-operative obstruction is emphasized.

Dr. Coupal points out the clinical and radiological similarity of miliary blastomycosis and tuberculosis. Syphilis, yaws, leprosy and Hodgkin's must also be considered.

X-rays and radium cure large numbers of superficial skin cancers according to Dr. Ochsner and are a most important adjunct in all malignancies both before and after surgery.

Dr. Hoy advises that in fractures of the spine, careful X-ray views should be made at once. Both antero-posterior and lateral views are essential.

The various subjects are well covered in a concise manner. The book is a valuable asset to the reference library of either the specialist or general practitioner.

B. C. CUSHWAY, M.D.

THE EFFECT OF X-RAYS ON CALLUS FORMATION IN UNUNITED FRACTURES

A Preliminary Report[1]

By ERNST A. POHLE, M.D., Cleveland, Ohio
From the X-ray Department of Mt. Sinai Hospital

THE effect of X-rays on living bone tissues is principally the same as on any other kind of living cells; it is apparent that bone can endure much higher doses of radiation without harm than the rest of the tissues. Furthermore it may be assumed that besides a destructive dose (overdose) there may exist a so-called stimulating dose (small dose) which will stimulate the growth of the bone or its regeneration. This is said of cells in general (Bergonié and Tribondeau, Albers-Schoenberg, Knox, M. Fränkel, Wintz) in contradiction to Holzknecht, Kienboeck and Porges.

The destructive effect of high doses of X-rays on the formation of callus is certain (Cluzet and Dubreuil, 1). The stimulating action on bone regeneration and formation is evident in observations of Wiesner (2), who found that very young persons who work with X-rays in a factory show an unusually early ossification of the cartilage of the ribs. But the first author to draw attention to the therapeutic value of X-rays as promoters of the callus formation is M. Fränkel (3, 4), whose observations form the basis for all further investigations. In recent years these ideas have been revived and Tamann (5) has seen in animal experiments a very marked influence of X-rays on the healing of fractures, if the area of the lesion be irradiated from 1 to 10 days after the fracture. Lehmann (6) reported the complete regeneration of the resected head of a humerus after irradiation. Holfelder (7) is also in favor of the therapeutic use of X-rays in fracture cases. On the other hand, W. Mueller (8, 9) denies ever having seen a promoting influence of radiation in small doses on the callus formation, and agrees only with the destructive effect of high doses.

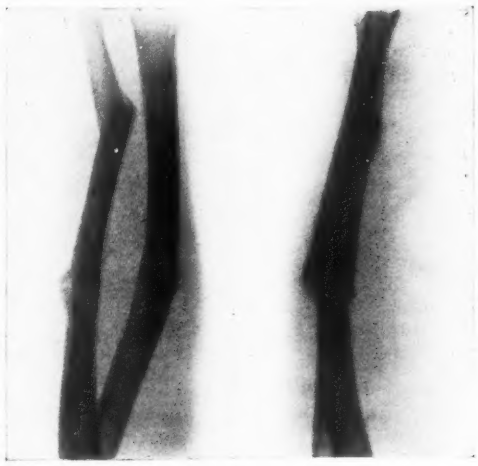


Fig. 1. Case 1.

It is a fact that the theory of the stimulating effect of X-rays cannot be said to be definitely established (10), but it is also a fact that in certain cases of very poor callus formation one or more exposures to small X-ray doses lead to the healing of the fracture. I have up to date treated 15 cases,[2] 11 of which were clinically healed, three did not respond, one is still under treatment. Briefs of these histories are given here:

Case 1.—S. Y., age 40 years, male, automobile accident on June 3, 1923. Compound fracture of right ulna (2x broken) and radius. Spent two weeks in hospital, does not show callus. Saw Dr. Stern on September 23; very little callus formation, no union (Fig. 1), arm in leather pad. Referred for X-ray therapy on February 9, 1924 (Fig. 2). Technic used: 160 K.V., 4 ma., 0.5 cu. + 1.0 Al., 5 × 15 cm. field of entry, 50 cm. F.S.D. 28 mam. (Ca. 10 per

[1]Read before the Clinical Orthopedic Society at its annual meeting, Cleveland, Ohio, Nov. 10, 1924.

[2]I wish to thank Dr. W. G. Stern for referring these cases to me.

Fig. 2, Case 1.

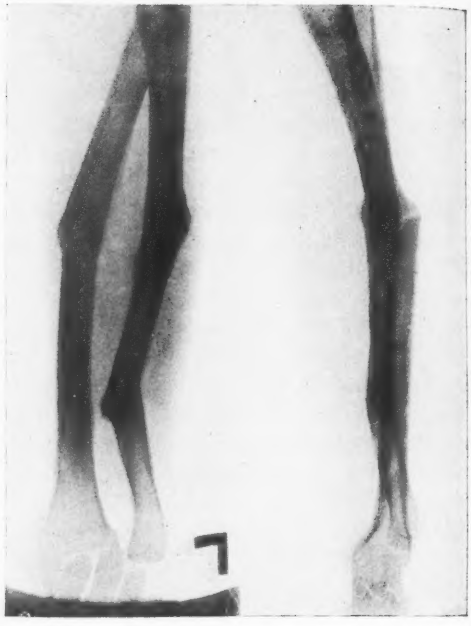


Fig. 3, Case 1.

cent H.E.D.). Radiograph taken on the sixteenth of February shows moderate callus formation (Fig. 3). The double dose was given on April 19, 1924. On March 24, 1924, there was definitely more callus than on previous film (Fig. 4). In May and June, patient had eighteen treatments with the Ultra Sun Lamp (Landecker-Steinberg)[3] at 20 minutes each. The last radiograph, taken on June 16, shows fragments united and good callus formation. Clinically the fracture is healed (Fig. 5).

Case 2.—R. S., age 32 years, female. Fracture of right femur on August 12, 1923. Leg in splint. September 8, cast put on. October 20, intermedullary bone peg of right femur. Very little callus. October 24, X-ray stimulating dose. Discharged from hospital February 3, 1924, healed.

Case 3.—A. W., age 26 years, male. Compound fracture of left radius and ulna on December 1, 1923. Arm in splint. December 8, reduction of fracture. December 13, manipulation and rotation of radius and ulna. December 24, cast put on. Discharged December 25, 1923. As there was no callus formation, patient had X-ray treatment on January 12, 1924. The fracture is now healed.

Case 4.—W. E. McC., age 49 years, male. Fracture of middle third of left tibia and upper third of left fibula, November 24, 1923. Leg in splint. On November 27, cast put on. Discharged next day. There was very little callus formation in March, 1924. Patient had X-ray dose on March 1, 1924. He responded very quickly to this treatment and two months later there was a marked improvement. Is entirely well now.

Case 5.—W. D., age 40 years, female. Fracture of neck of left humerus with rotation of head, on August 12, 1924. Manipulation done in another hospital. Open reduction by Dr. Stern. September 2, 1924, cast put on left arm. X-ray stimulating dose on September 8, 1924. Not healed as yet.

[3] I am obliged to the American Kreuger and Toll Corp., New York, who put this lamp at my disposal.

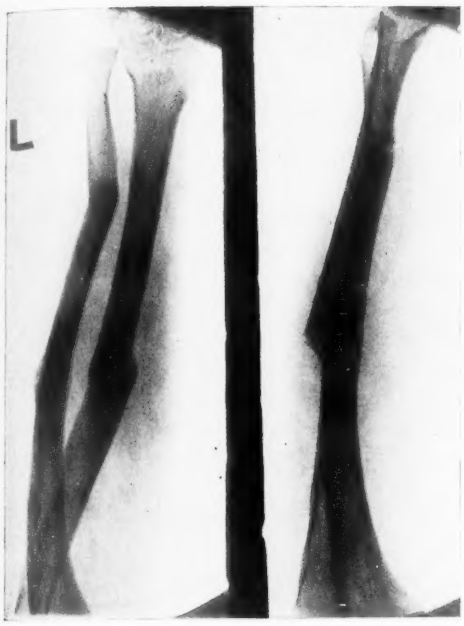


Fig. 4, Case 1.

Fig. 5, Case 1.

Case 6.—B. K., age 36 years, female. Fracture of lower third of right femur on January 26, 1924. Reduction and manipulation on January 27. Cast to left hip on January 28. Cast readjusted on February 27, no union. X-ray stimulating dose, March 3. Bone graft to femur on April 17. Second X-ray exposure on April 28. There is perfect union now.

Case 7.—R. H., age 30 years, male. Fracture of right tibia and fibula above the ankle. He was operated on and Lane plate was put in place. After six weeks he was up on crutches and later could walk without artificial assistance. However, there has always been a red and swollen area about the site of the old fracture on walking, and the leg shows about one inch shortening and was also painful when used. Bone graft to right tibia, March 11. Stimulating dose on March 22, 1924. There was no union on last examination.

Case 8.—G. K., age 35 years, male. Fracture of lower third of left tibia and fibula on January 21, 1924. Cast to leg on January 22. No callus formation. X-ray stimulating dose on March 8. Healed up in about two months.

Case 9.—T. R., age 40 years, male. Fracture of left radius and ulna in April, 1923. No union in March, 1924. Bone graft on radius and ulna on March 24, 1924. X-ray stimulating dose given on March 31. Arm is healed now.

Case 10.—G. W., age 36 years, male. Compound fracture of left thigh on February 19, 1924. First on Blakin frame, later cast to leg. Very little callus. X-ray stimulating dose on April 21, 1924. One month later radiograph showed good bone callus.

Case 11. — H. B., age 31 years, male. Left jaw fractured on January 17, 1924. Five days after accident jaw was wired, until April 16. Bone graft on April 19. X-ray stimulating dose on April 28. Healed perfectly.

Case 12. — H. H., age 27 years, male. Fracture of left thigh in September, 1923. Was several months in hospital. Leg in splint; in cast for another six weeks. Then brace applied. Walked on crutches. X-ray

stimulating doses on May 9 and June 6. Admitted to hospital on July 28 with a diagnosis of ununited fracture of middle third of left femur. Discharged July 30, 1924, by release. Condition not improved.

Case 13. — A. K., age 36 years, male. Fracture of middle third of left tibia in December, 1923. Was in hospital for seven weeks, then at home in bed for six weeks. Was not able to walk. No union. Bone graft of left tibia on July 5, 1924. X-ray stimulating doses on July 23 and August 25, 1924. Healed now.

Case 14. — W. T., age 23 years, male. Fracture of lower third of right radius and ulna on June 21, 1924. Open reduction was done on June 24, 1924. Splint applied. No union in August. X-ray stimulating doses given on August 6, September 6, and October 7, 1924. Last radiograph showed a moderate callus formation. Still under treatment.

Case 15. — R. S., age 23 years, male. Fracture of middle of right humerus in December, 1922. Patient was in a hospital for ten weeks; never had the use of his arm, but bone had united. On July 23, 1924, he refractured the arm by bumping it. Arm was in a splint for four weeks. Heat and massage were applied. No improvement. Bone graft of right humerus on August 5, 1924. X-ray stimulating doses on August 26 and September 23, 1924. Arm is perfectly well now.

I have been impelled by these observations, and encouraged by Dr. W. G. Stern, to draw the attention of the profession to this therapeutic method of healing ununited fractures. Although it has not been successful in all cases, nevertheless I feel justified in recommending its employment in order that a sufficient number of cases may be reported to enable physicians to better judge the efficacy of this procedure.

BIBLIOGRAPHY

1. Cluzet and Dubreuil: Action des rayons X sur le développement du cal. Jour. de physiol. et de pathol. gén., XV, 1913, p. 327.
2. Wiesner, B.: Fruehzeitige allgemeine Verknoecherung der Rippenknorpel. Muenchen. med. Wchnschr., 1910, p. 1124.
3. Frankel, M.: Die guenstige Einwirkung der Roentgenstrahlenreizdosen bei der Heilung von Knochenbruechen. Zentralblatt f. Chirurgie, 1914, p. 1105.
4. Frankel, M.: Zur Heilung von schweren Knochenbruechen mittels Roentgenreizdosen. Med. Klin., 1915, p. 211.
5. Tamann, H.: Ueber den Einfluss von Roentgenstrahlen auf die Frakturheilung. Bruns' Beitraege z. klin. Chir., Bd. 128, Heft 3, 1923, p. 536.
6. Lehmann: Knochenregeneration nach Roentgenbestrahlung. 47, Verhandl. d. deutsch. Gesellsch. f. Chir., 1923.
7. Holfelder, H.: Med. Klin., 1922, pp. 1325 and 1353.
8. Mueller, W.: Muenchen. med. Wchnschr., 1923, p. 980.
9. Mueller, W.: Die normale und pathologische Physiologie des Knochens: Leipzig, 1924.
10. Czepa, A.: Das Problem der wachstumsfoerdernden und funktionssteigernden Roentgen-Radiumwirkung. Strahlentherapie, 1924, XVI, 913.

Diphtheria carriers.—Data are presented which show that 152 of the author's original 185 cases of carriers treated by roentgen radiation have tended to remain free from virulent diphtheria organisms, as determined by reculture after an interval of ninety days. A second series of cases is presented in all of which negative cultures were obtained following one and at most two roentgen treatments.

The second series of cases were treated with a broad focus Coolidge tube, 10-inch focal skin distance, 7-inch spark gap, 5 ma., filtered through 3 mm. Al., time, 4 min., with both tonsil areas and post-nasal space treated at each sitting. The interval between successive treatments varied from ten to fourteen days.

No bacterial effects for the roentgen rays are claimed, but it is believed that the results obtained are due to the fact that the tissues of the throat and nasopharynx are altered to such a degree that, instead of being suitable soil for the propagation of bacteria, they become decidedly unsuitable.

J. D. Camp, M.D.

The Treatment of Diphtheria Carriers by Roentgen Radiation. Dalton Kahn. Am. Jour. Roentgenol. and Rad. Ther., Oct., 1924, p. 343.

CASE REPORTS

REPORT OF A CASE OF LYMPHOSARCOMA OF THE CECUM [1]

By THEODORE S. SWAN, M.D., Fellow in Medicine, The Mayo Foundation, ROCHESTER, MINNESOTA

A man aged fifty-five years registered at the Mayo Clinic June 6, 1923, who had been sallow and had been troubled with gas on the stomach for six months. Two years before, he had had diarrhea (five to six stools a day) for a month, without blood or mucus, or abdominal cramps. One month before examination he had noticed bloating in the epigastrium, and had considerable belching and flatus and an "uneasy full feeling" in the epigastrium. Diarrhea (five to six stools daily) reappeared with slight cramping in the lower abdomen. Nine days prior to coming to the Clinic the patient was examined elsewhere, and a mass found in the right side of his abdomen, which seemed to be increasing in size. A slight burning sensation over the mass was noted, but no pain.

On physical examination a small adenoma of the thyroid was palpable. A large nodular firm mass was palpable in the right upper quadrant of the abdomen. The liver was apparently slightly enlarged. A right inguinal hernia was demonstrated. The prostate was firm, slightly nodular, and enlarged 2 on a scale of 1 to 4. Examination of the urine was negative. The erythrocytes numbered 2,860,000, the leukocytes 12,500. The color index was 0.6+. The hemoglobin was 40 per cent. The differential count was 200 cells, lymphocytes 13,

Fig. 1. Filling defect in the cecum and ascending colon.

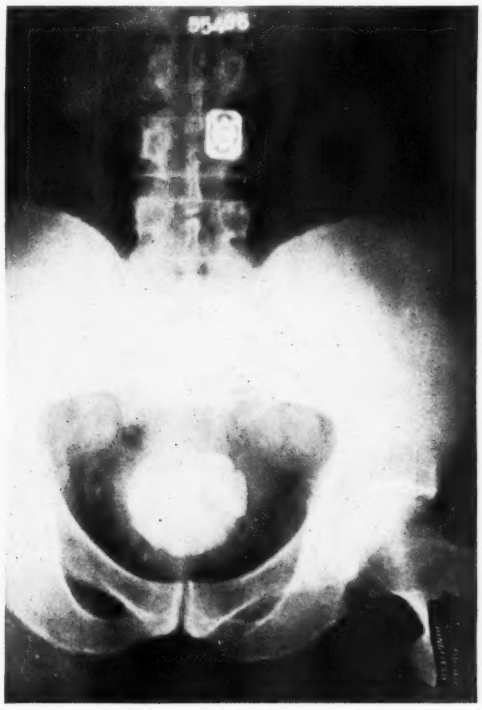


Fig. 1, Case 1. (See next page.)

[1]Presented for publication September 27, 1924.

large mononuclears 3, transitional 1, neutrophils 77.5, eosinophils 3, basophils 2.5 and slight anisocytosis and poikilocytosis. The blood Wassermann reaction was negative. A fractional test meal revealed anacidity. X-ray examination of the chest, stomach, kidneys, ureters and bladder was negative. A lesion was found in the cecum and ascending colon with obstruction (Fig. 1). A diagnosis was made of carcinoma of the ascending colon.

Seven cubic centimeters of the ileum, the cecum, the ascending half of the transverse colon, and the appendix, were resected with end-to-side anastomosis between the ileum and transverse colon. The mesenteric glands were also removed. The pathologist found a lymphosarcoma (8 by 7 by 4 cm.) of cecum, with glandular involvement 4. The patient died on the thirteenth day after operation, of bilateral bronchopneumonia. Necropsy was not performed.

TWO CASES OF FACETED CALCULI OF THE URINARY BLADDER

By F. S. O'HARA, M.D., Springfield, Illinois

Case 1. A. U., male, aged 65 years, weight 175 pounds, first came under observation in July, 1924. History revealed frequency of urination over period of a year. About six months previous to examination he passed a small calculus, and in consequence visited a chiropractor for treatment. This individual made a diagnosis of cancer, and for three months treated the man by rubbing. By this time the suffering from frequency and urgency of urination had become so acute that the patient placed himself under the care of a physician. In the course of a thorough examination the position of the stones in the urinary bladder evidently shifted (prostatic manipulation), and caused distress in the pelvis. Before X-ray examination was made the patient passed eight small stones, each a perfect pyramid. X-ray examination made July 24, 1924 (Fig. 1), showed stones grouped in the urinary bladder in an almost spherical mass measuring 65 mm. by 60 mm. Physical examination negative, except as concerned the urinary tract. Pus in urine. Operation July 26 under general anesthesia, by Dr. Herbert B. Henkel, when twenty-five faceted stones

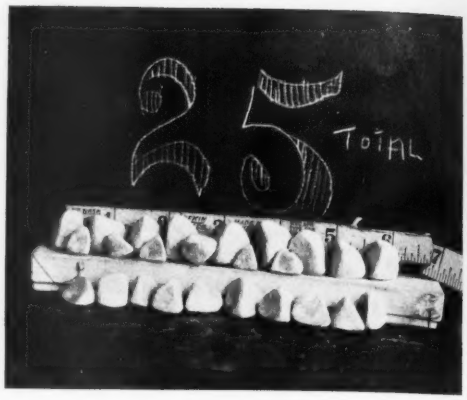


Fig. 2, Case 1.

Fig. 3, Case 2.

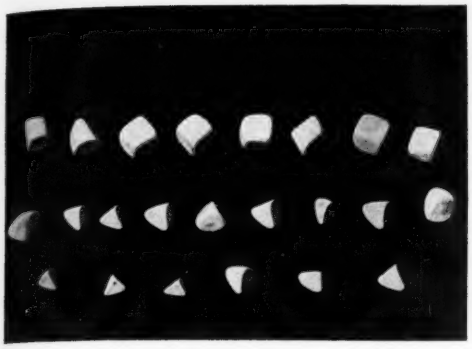


Fig. 4, Case 2.

(Fig. 2) were removed. Recovery uneventful.

Case 2. The patient, a physician aged 75 years, has suffered frequent attacks of cystitis during the past four years. About fifteen years previous to the present attack he passed a renal (?) calculus. The X-ray examination showed an irregular group of stones in the urinary bladder (Fig. 3). On September 24, 1924, Dr. Herbert B. Henkel performed a suprapubic cystotomy under general anesthesia and removed twenty-three stones (Fig. 4). Recovery uneventful.

DEPARTMENT OF RADIODONTIA

UNDER THE SUPERVISION OF BOYD S. GARDNER, D.D.S., ROCHESTER, MINNESOTA

THE RELATION OF THE ROENTGEN RAY TO THE NEWER METHODS OF EXTRACTION [1]

By BOYD S. GARDNER, D.D.S., Section on Dental Surgery, Mayo Clinic, ROCHESTER, MINNESOTA

THE roentgen ray should receive full credit for the newer surgical technic employed in the removal of teeth, and if the members of the dental profession will co-operate with this and similar societies, much more good can be accomplished in this respect. Roentgen-ray examinations of the supposedly edentulous areas brought attention to the large number of roots, unerupted teeth, and residual areas of infection, which were left, without knowledge to the patient, and usually to the operator. These data alone emphasize the importance of a change in methods of extraction.

The newer or open view operation was early mentioned by Novitsky and Shearer, and at once met with objections from practically the whole dental profession. Even with its present refinements, it is still receiving the usual amount of criticism from the so-called "stand pat" members of the dental profession, but it is gratifying to learn that, as misunderstandings with regard to the exact nature of the operation are cleared up, it is becoming more and more popular.

The post-operative roentgen-ray examination as a routine procedure is the "whip" which, if used, will increase the popularity of the operation, as it will stand the test of such examination.

The technic employed in the open view operation is not at all new from a general surgical standpoint. We have merely copied the principles which have made other surgery successful. Instead of removing the teeth with the soft tissues in place, these are first retracted, which gives the operator an opportunity to actually examine the alveolar process overlying the teeth in ques-

[1] Read before the Radiological Society of North America, at Kansas City, December 8-12, 1924.

tion. It is obvious that with this additional information, teeth can be extracted with less loss of the process and that the pathologic conditions can be visualized and removed. Moreover, the operator has an opportunity to shape the remaining alveolar process, so that the patient can have a better denture in the shortest time possible. In addition, trauma is minimized, adjacent teeth are respected, post-operative pain is lessened, and the process is left in such a condition that early repair results. This does not imply that this method of extraction should be used in every case. Each case is a study in itself, and many teeth can still be simply "pulled" and satisfactory results obtained.

The objections to the operation are best answered as follows: The operation has to be seen to be appreciated; it must be done under as aseptic conditions as any other surgery, and can be done better under block anesthesia; also it takes some time to become proficient in the technic. As we have in our profession those who are not willing to comply with the above requirements, it is readily seen that the objectors are numbered among those who still "pull" teeth. The fact that, as dental students, we had to dissect in the anatomic laboratory practically the entire body, rather than the field for which we are responsible, also accounts for some of the objections.

No doubt, many patients have had their mouths examined by competent roentgenologists, infected teeth discovered and extraction advised. However, the systemic disease did not clear up following the extraction, and hence the examining physician is less inclined to consider infected teeth as the source of disease. On the other hand, if the teeth had been removed in their entirety, together with the adjacent diseased tissue, the result might have been different.

In conclusion, I would like to encourage those who are engaged in dental roentgenology to urge the use of the post-operative roentgen-ray examination as a routine procedure, as it will do more to improve the technic employed in extracting teeth than any other one factor.

CASE REPORTED BY DR. J. H. BECKWITH, FLINT, MICHIGAN

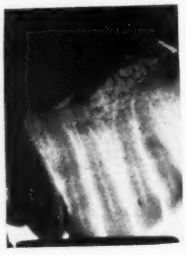


Fig. 1, *a*. Pre-operative roentgenogram.

Fig. 1, *b*. Post-operative roentgenogram.

A middle-aged man, a factory employee, had suffered intense pain in the back of the head for two years, and had been unable to work for the six months preceding examination. His mind was affected, and his wife and friends claimed that he showed signs of insanity. On November 3, 1924, the impacted cuspid, Figure 1, *a*, was removed. Pain was relieved almost instantly and the patient was able to be around. On November 15 he reported in person for treatment and is in better condition than he has been for two years.

This case emphasizes the necessity for full-mouth roentgenograms. It is obvious that without a thorough X-ray examination teeth such as this would not be found. Unfortunately, the teeth whose removal results in systemic improvement are usually those that do not produce dental symptoms.

EDITORIAL

M. J. Hubeny, M.D. . . . . *Editor*
Benjamin H. Orndoff, M.D. } . *Associate Editors*
John D. Camp, M.D. }

Contents of RADIOLOGY copyrighted by the Radiological Society of North America.

DANGERS IN ROENTGENOLOGY

The universal use of the roentgen rays in diagnosis in all first-class hospitals, the great increase in demand for diagnostic work, and the enthusiastic reports concerning the therapeutic results obtained in roentgen therapy, are leading many physicians to the conclusion that the dangers from X-ray work have been eliminated. Those who have been making these reports, however, occupied their time with the reports and are fully cognizant of the dangers involved, but have probably not emphasized them. These dangers are, however, fully recognized by all of the older roentgenologists, and it is most important that all younger roentgenologists, technicians and those interested become fully cognizant of the dangers and of the methods of avoiding them.

A report made by Mr. Whiteside, attorney for the Medical Society of the State of New York, before the Eastern Section of the American Roentgen Ray Society, at Atlantic City, has called attention especially to the increased dangers involved in this work. Recently there has come to my attention a letter written by an insurance company, in which the insurance company has refused to assume the obligation of protection to a physician who refers a patient to a roentgenologist for treatment, in case the attending physician is sued singly or jointly with the roentgenologist for any damages that may occur.

Groedel analyzed seventy-five cases of injury before the German Roentgen Congress in April, 1924. Fourteen of these injuries were due to accident, twenty-one to carelessness, and forty were the results of ignorance. It is very evident that it is our duty, as an organization, to take every possible step to caution all workers to provide against accidents and to eliminate carelessness and to help them overcome their ignorance. Toward this end, the Philadelphia Roentgen Society, at its regular meeting in March, 1925, devoted an entire evening to the consideration of the dangers from X-ray work and how to avoid them. Two or three meetings of this kind could profitably be devoted to this subject. Unfortunately, those who need such help most are generally the group who never read medical journals and X-ray journals, nor attend the medical meetings, yet their damages bring as much discredit to us as if done by someone more thoroughly alert, for the laity do not discriminate between the good and bad operators.

As a matter of fact, the X-rays are to-day more dangerous than ever because of the more powerful machines used. Our safety lies in the information that we have of the means of protection. It is, therefore, clearly our duty to warn, to help, to instruct and to encourage everyone to obtain the information and to take all possible precautions against damage to either the patient or himself. This caution and responsibility applies, also, to the salesmen who are distributing these powerful machines throughout the country.

George E. Pfahler, M.D.

THE ASSOCIATE EDITORSHIP

Dr. E. W. Rowe, who has been active in the Society's affairs for many years, has been compelled to lighten some of his responsibilities so that he can devote the necessary energy required for a complete de-

velopment and functioning of the Technicians' Bureau.

Dr. Rowe has been an ardent participant in all the constructive problems confronting the Society, and during some of the recent difficulties his staunchness in supporting questions of principle has been unequivocal and unquestioned.

It was with regret that he found himself obliged to give up his duties as Associate Editor of RADIOLOGY, and it is with greater regret that his resignation is reluctantly accepted.

Dr. John D. Camp has been appointed Associate Editor, his functions commencing with this, the July, issue. At present he is identified with the Massachusetts General Hospital, in Boston, prior to which he was a Fellow of Roentgenology at the Mayo Clinic.

SECTION ON RADIOLOGY, WISCONSIN STATE MEDICAL SOCIETY

The first meeting of the Section on Radiology of the State Medical Society of Wisconsin was held at Madison, April 30, 1925. About sixty physicians, all of whom are interested in the science of radiology to a greater or less extent, and many of whom are devoting their entire time to this science, were at this meeting. The program was arranged by Dean C. R. Bardeen of the medical department of the University of Wisconsin. The meeting opened by a session at the University, demonstrating the value of the X-ray in teaching physiology and anatomy. All were impressed with the excellent way in which Dr. Meek and Dr. Sullivan have been able to put into practice the theories on their particular subjects. The afternoon session was held at the new Wisconsin General Hospital. Dr. Eyster has been instrumental in interpreting the value of changes in the heart size as a method of diagnosis, and his demonstrations were most interesting and valuable. Dr. Middleton on Pulmonary Roentgenology and Dr. Hager on Renal Roentgenology are authorities on their respective subjects. Dr. Sisk's Technic of Gastro-enterology and the use of his new table, on which he is able to take four pictures on one plate during one inspiration, was demonstrated, and his enthusiasm over fluoroscopy as an important means of gastro-intestinal work, opened considerable discussion, which, of course, was profitable to those present.

Later the entire group went by automobile to Farwell's Point, at Mendota, the trip around Lake Mendota being most enjoyable. Dr. Fred Hodges, in charge of the Radiological Department, was host at his home, after inspection of the Soldiers Memorial Hospital for Mental Diseases. Dr. Hodges is particularly adapted for the development of new apparatus owing to his mechanical ability, and displayed many interesting pieces of apparatus which he has put into use, particular attention being paid to skull radiology.

The dinner at Farwell's Point was most enjoyable, after which Dr. A. U. Desjardins, of Rochester, Minn., delivered an address on Common Misconceptions in Radiotherapy. The meeting adjourned with an expression by the entire group that it had been well worth attending, and a rising vote of thanks was extended to Dean Bardeen and the members of the University faculty, together with Dr. Desjardins, for their co-operation.

LOCAL ARRANGEMENTS COMMITTEES

CLEVELAND MEETING

DECEMBER 7-11, 1925

General Chairman of all Committees: Dr. Walter C. Hill, 2930 Prospect Ave., Cleveland.

Hospitality Committee: Dr. B. H. Nichols, Dr. E. P. McNamee and Dr. U. V. Portmann.

Scientific Exhibits: Dr. W. I. LeFevre, Dr. R. G. Giles, Dr. J. E. Oliverbaum.

Commercial Exhibits: Dr. E. F. Freedman, Dr. N. W. Shetter, Dr. J. R. Driver.

Hall Committee: Dr. M. A. Thomas, Dr. Richard Hayes, Dr. R. V. May.
Hotel Committee: Dr. Thomas E. Jones, Dr. A. Strauss, Dr. T. J. Taylor.
Hospital Committee: Dr. H. L. Farmer, Dr. L. A. Pomeroy.
Publicity Committee: Dr. R. J. May, Dr. W. I. LeFevre.
Reception Committee: Dr. J. D. Osmond and all members of the Cleveland Radiological Society.
Transportation Committee: Dr. U. V. Portmann, Dr. J. H. West.
Local Finance: Dr. R. J. May, Dr. W. I. LeFevre, Dr. J. D. Osmond.
Ladies' Reception Committee: Mrs. W. I. LeFevre, Chairman; others will be appointed later.

INTERNATIONAL CONGRESS OF RADIOLOGY, LONDON, JULY 1-4, 1925

The date, first of May, having expired for receipt of papers to be read at the above Congress, it is possible now to set out an advance, but incomplete, list of the persons proposing to read papers, with, in most cases, the subjects of their papers.

The number of papers will be seen to be large and the subjects inclusive, so that there can hardly be any radiologist or allied worker who will fail to be interested.

The work of the Congress will be divided into three sections, namely, Radiology, Physics, and Electrotherapy and Physiotherapy. To get through the large number of papers proposed for the section of Radiology that section will probably meet in two parallel sessions each day, the subjects for this purpose being divided into those bearing on diagnosis and those bearing on therapy.

On the opening day the sections of Radiology and Physics will meet in joint sessions for a discussion on the standardization of dosage, which will be opened by Professor Bragg from the physical standpoint, and by Dr. Béclère, of Paris, from the medical.

On the evening of that day the Silvanus Thompson Memorial Lecture will be delivered by the Duc de Broglie, of Paris. On the second night a Congress dinner will be held, and on the third night Sir Berkeley Moynihan will deliver the MacKenzie Davidson Memorial Lecture.

The daily program remains to be made up in detail, and will be announced shortly.

Meanwhile, it may be noted that the section of Electrotherapy and Physiotherapy intend to devote their three sessions, respectively, to Heliotherapy, probably introduced by Sir Henry Gauvain, Diathermy, probably introduced by Dr. Cumberbatch, and to some branch of Physiotherapy.

The papers received or promised for the Radiology section are here listed under a rough subject classification, the full titles being quoted where those are known.

PAPERS IN RADIOLOGY SECTION

Bones

1. Dr. A. W. George, Boston. A Method of Diagnosis of the Injuries of the Atlas and Axis.
2. Dr. W. H. Stewart, New York. The Time Factor in the Disappearance of Roentgenographic Evidence of Fracture of the Skull.
3. Prof. H. Kienbock, Vienna. Bone Tumors: Differential Diagnosis by X-rays.
4. Dr. A. Howard Pirie, Montreal. Normal Rarities of Bone Simulating Disease.

Fetal

1. Dr. H. A. Harris, London. The Embryo and the Fetus in Radiology.
2. Dr. Carlos Heuser, Buenos Aires. Radiography in the Early Months of Pregnancy.

Urinary

1. Dr. E. H. P. Cave, Harrow. X-ray Examination of the Male Urethra.

Alimentary Tract

1. Dr. Lewis Gregory Cole, New York. Cinematographic Demonstration.

2. Dr. Charles Eastmond, Brooklyn. Chronic Infection of the Gastro-intestinal Tract: Its Roentgen Manifestations.
3. Dr. H. M. Imboden, New York. Intermittent Obstruction of the Small Intestines.
4. Dr. James T. Case, Battle Creek. Diverticula of the Small Intestine.
5. Dr. R. O. Moody, Dr. W. E. Chamberlain, Dr. R. S. Van Nuys, Oakland, Cal. Living Anatomy of the Stomach, Liver and Colon; Results of a Roentgenologic Study of 1,000 Healthy Adults.
6. Dr. H. H. Berg, Frankfort-on-Main. Direct Signs of Duodenal Ulcer.
7. Dr. N. Ratkoczi, Budapest. Duodenal Studies.
8. Prof. Gosta Forssell, Stockholm. Further Observations on the Motor Mechanism of the Mucous Membrane of the Digestive Tract.
9. Sir J. Frank Colyer, London. Radiology and the Practice of Dental Surgery.
10. Dr. A. E. Barclay, Manchester.
11. Dr. G. Kharmandarin, Kharkow. On the Roentgenological Diagnosis of Chronic Appendicitis.
12. Dr. de Backer and Dr. Van de Putte, Ghent. Etude Radiologique de la Traversee Digestive chez le Nourrisson Normal.

Gall Bladder

1. Dr. P. F. Butler, Boston. Physiology of the Gall Bladder.
2. Dr. Sherwood Moore, St. Louis. The Development of Cholecystography.
3. Dr. R. D. Carman, Rochester. Cholecystography: Some Developments in its Application to the Diagnosis of Cholecystic Disease.
4. Dr. L. Bischoff, Lugano. Contribution to the Study by X-rays of the Pathologically Enlarged Gall Bladder.
5. Dr. Karl Herman, Szubotitza. Radiological Representation of the Gall Bladder after Graham.

Radium Therapy

1. Dr. G. Failla, New York. A New Method of Intra-tumoral Irradiation.
2. Dr. Douglas Quick, New York. The Treatment of Carcinoma of the Tongue.
3. Dr. Cordua, Kiel. The Morphology of the Collumcarcinomata of the Uterus as a Basis for the Judgment of the Sensibility to Rays.
4. Prof. Bayet, Paris. Radium Surgery.
5. Dr. S. A. Heyerdahl, Oslo. Actinomycosis Faciei and Colli Treated with Radium.
6. Prof. F. Gudzent, Berlin. On the Biological and Therapeutical Properties of Small Radio-active Substances.
7. Dr. Robert Coliez and Dr. Lucien Mallet, Paris. Etude de Répartition de l'energie Rayonnante Gamma dans les Applications Curietherapiques Internes.
8. Dr. Lucien Mallet and Dr. Robert Coliez, Paris. Techniques de Curietherapie Profonde.
9. Dr. Preserutti, Turin. The Various and Practical Therapeutical Applications of Leather Rendered Radiferous.
10. Dr. R. G. Canti and Dr. F. G. Spear, London. The Effect of Radium on Mitosis in Tissue Culture.
11. Mr. Malcolm Donaldson, London. A Report on 85 Inoperable Cases of Carcinoma of the Cervix Treated by Radium.
12. Dr. Regaud, Paris. Sur la Curietherapie des Epitheliomas de la Langue et des Adenopathies Cancereuses Cervicales.
13. Dr. N. S. Finzi, London. The Use of Radium in Combination with X-rays and Surgery.

14. Mr. W. Sampson Handley, London. The Encirclement Method of Radium Treatment.
15. Dr. Douglas Hermer, London.
16. Dr. J. Douglas Webster, London.
17. Dr. Neumann, Brussels.
18. Dr. Sluys, Brussels.
19. Dr. Delporte, Brussels.
20. Dr. Lacassagne, Paris.
21. Prof. Proust, Paris.
22. Dr. F. T. Tomanck, Prague. The Results of Treatment of Pernicious Anemia with Radium.
23. Dr. F. Tomanck, Prague. The Effects of Prolonged Radiation in Treatment of Leukemia.
24. Dr. de Backer, Ghent. Radiotherapie et Formation de Fistule.
25. Prof. Daels, Ghent. Contribution to the Experimental Provocation of Tumors by Means of Radium.
26. Prof. Daels and Dr. de Backer, Ghent. Contribution to the Technic of Intraperitoneal Irradiation of Cancer of the Cervix Uteri.
27. Mr. J. Valcke, Ghent. Contribution à l'Etude de la Desinfection du Cancer du Col Uteri.

Heart

1. Dr. George W. Holmes, Boston. Aortic Regurgitation: The Use of the X-ray in the Differentiation of Etiological Types.
2. Dr. Robert Knox, London. Investigation of the Cardiac Movements by the Use of the Slit Diaphragm and the Moving Film.

Lungs

1. Dr. W. F. Manges, Philadelphia. Non-opaque Foreign Bodies in the Air Passages and Food Passages.
2. Dr. S. A. Reinberg, Leningrad. Roentgen-ray Studies on the Physiology and Pathology of the Tracheo-bronchial Tree.
3. Dr. Jaquerod, Leysin. The Radiographic Control of the Healing of Tuberculous Lesions of the Lungs.
4. Prof. L. Kupferle, Freiburg. The Anatomical Analysis of the Roentgen Picture in Phthisis.
5. Dr. Lars Edling, Lund, Sweden. Roentgen Rays in the Diagnosis of Pulmonary Anthracosis.
6. Dr. Walter Altschul, Prague. Temporary Relaxation of the Diaphragm.
7. Dr. Woodburn Morison, Manchester. Diaphragmatic Hernia.
8. Dr. Stanley Melville, London.
9. Dr. A. C. Jordan, London. Peribronchial Phthisis.
10. Mr. Morriston Davies, North Wales. The Importance of Radiology in Connection with Thoracic Surgery.

X-ray Therapy

1. Dr. Isaac Gerber, Providence. The X-ray Treatment of Superficial Pyogenic Infections, Particularly of the Skin.
2. Dr. George E. Pfahler, Philadelphia. The Saturation Method in Roentgen Therapy.
3. Dr. Burton J. Lee, New York. A Report of a Series of Cases Treated by Radiation and Conservative Surgery. From the Breast Clinic of the Memorial Hospital, New York.
4. Dr. James Ewing, New York. Tissue Reactions to Radiation.
5. Dr. Edwin C. Ernst and Dr. Montrose T. Burrows, St. Louis. Studies on the Biological Effect of X-rays.
6. Dr. A. W. Erskine, Cedar Rapids, Iowa. Effective and Economic Filtration.
7. Dr. Ralph H. Herendeen, New York. Results in the Roentgen-ray Treatment of Medullary Bone Tumors.
8. Dr. S. Fraenkel, Moscow. Effect on the Cell by Isolated Treatment of the Blood by X-rays.

9. Dr. A. Rosselet, Lausanne. L'Action Indirecte en Radiotherapie.
10. Prof. M. O. Nemenow, Leningrad. A Contribution to the Biological Action of Roentgen Rays.
11. Dr. E. H. Zweifel, Munich. Distant Effect of X-ray in Basedow's Disease.
12. Dr. E. H. Zweifel, Munich. The Stimulating Dose.
13. Dr. F. Tomanck, Prague. Present and Future of X-ray and Radium Therapy.
14. Dr. E. Van Acker, Ghent. Contribution à l'Etude des Modifications Histologique Consecutive à l'Irradiation.
15. Dr. Walter Altschul, Prague. Critical Discussion of Dosage.
16. Dr. Albert Soiland, Los Angeles. The Treatment of Cancer of the Breast from the Viewpoint of a Radiologist.
17. Dr. T. S. P. Strangeways and Prof. Hopwood, London. The Effect of X-rays on Mitosis in Tissue Culture.

Nervous System

1. Dr. J. W. Pierson, Baltimore. The Localization of Brain Tumors by Ventriculography.
2. Dr. P. M. Hickey, Ann Arbor, Michigan. X-ray Findings in the Epileptic Skull. A Report on 600 Cases.
3. Dr. M. C. Sosman, Boston. A Consideration of Aneurysms of the Internal Carotid and Tumors at the Base of the Brain.
4. Dr. F. M. Law, New York. Roentgen Diagnosis of Mastoid Disease.
5. Dr. S. Fraenkel, Moscow. Encephalography.
6. Prof. A. Schuller, Vienna. Defects of the Skull.
7. Dr. Jacques Forestier, Aix-les-Bains. Radiodiagnosis by the Lipiodol Method.

Following is a partial list of the Americans who are going to attend the Congress: Drs. Eastmond, Pfahler, Stewart, Manges, Cole, Kann, Sosman, Ernst, Gladys Carr-Paterson, Pierson, Keal, L. R. Sante, Weitzner, Herendeen, Hickey, Burton J. Lee, Failla, Ray, Bliss, Case, Holmes, LeWald, Imboden, R. D. Carman, F. C. Christensen, L. R. Pearson, R. J. May, A. W. Erskine, Douglas Quick, L. Reynolds, A. H. Pirie, I. Gerber, R. O. Moody, A. W. George, A. Soiland, P. F. Butler, Sherwood Moore, R. H. Stevens, and L. Jaches.

THE COMMERCIAL EXHIBIT AT ATLANTIC CITY

Perhaps the most unique item on exhibition, revealing the astounding possibilities of roentgenographic technic, was the demonstration of two chest films by the Victor X-ray Corporation. These were obtained with a specially constructed machine and tube, using one thousand milliamperes for one one-hundred-and-twentieth of a second. The clarity and linear sharpness of the cardiac contour and other chest structures were most extraordinary. In addition to these films a number of other unusually clear chest roentgenograms were shown, obtained with the aid of the new 400 ma. Coolidge tube. This tube has now been placed on the market.

The Reaves Instrument Shop of Greensboro, N. C., demonstrated their latest model Radiographoscope. The innovations and improvements claimed for this apparatus are that the viewing boxes are so constructed that they duplicate the positions and angles of cassette to target at the time of exposure of the film. In addition, screens of eight different colors can conveniently be interposed between the source of illumination and the films. This is said to enable the observer to choose a chromatic illumination most suitable to his eyes, with a resulting improvement in the perception of detail and depth of the image. A further modification is the introduction of four curtains on each illumination box, so that

films of all dimensions may be held firmly and flat against the central portion of the view box glass.

James Picker, Inc., exhibited a very small Acme-International unit suitable for both fluoroscopic and radiographic work. The transformer and rectifying device are unusually compact and so designed that they can be placed entirely out of the way on a wall bracket. An output of 60 ma. at a 6-inch "back-up" is claimed for this unit. A very compact new model portable diathermy machine was also shown.

The Eastman Kodak Co. displayed the so-called "Tropical Hardening Bath" for use in those parts of the country where the fixing solution and water bath are to be had only at temperatures considerably above 65° C. As Mr. Wilsey explained in his paper, presented before the Society, the increased temperature of the water results in swelling of the gelatin coating of the film with a consequent impairment of clarity and loss of detail. The Tropical Hardening Bath should, under such circumstances, be used before immersion of the film into the fixing solution. After being submitted to this hardening bath the films may safely be fixed and washed in solutions up to 100° C.

Geo. W. Brady & Co. showed the Granger double 13° angle localizer for mastoid exposures. A new piece of apparatus demonstrated was a small flat grid Potter-Bucky diaphragm, with an arrangement for tilting to any desired angle. This apparatus is particularly designed for head work and has a head rest clamp attachment for aid in stereoscopic work.

The Kelley-Koett Manufacturing Co. had on display its latest model plate changer for stereoscopic chest work. The changing of the cassettes is accomplished smoothly and with what is practically noiselessness. The tube stand and the cassette-changing device are constructed in one unit so that the tube is always accurately centered.

A new "Power-Plus" transformer was also shown by this concern. This is a "12 inch" machine especially designed to meet the needs of future high milliamperage roentgenography. With seven Universal Coolidge tubes in parallel the output of this transformer was 525 ma. at a 7-inch "back-up." In this unit all of the current control and measuring devices are incorporated on the one instrument board of the control box.

The Dennos Products Co. had on display the Dennos Barium Meal put up in a new individual package and conveniently packed for immediate use.

Cooper and Cooper, Inc., exhibited a "U. S. Standard" four-compartment developing tank, manufactured by the U. S. Stoneware Co., of Akron, Ohio, made of one piece of glazed stoneware, which is claimed to be corrosion-proof.

The Hanovia Chemical and Manufacturing Co. demonstrated an improvement on the Alpine and Kromayer lamp consisting of a ratchet extension arm which aids in the ease of adjustment of the position of the lamp in relation to the part irradiated. A new Luxor Model Mercury Lamp designed for home use by the patient was also shown.

The Buck X-Ograph Company again exhibited the pneumatic cassette designed for improved film-screen contact.

The Liebel-Flarsheim Co. displayed the Hugh Young cystoscopic table with the flat grid Potter-Bucky diaphragm. This table can be placed in the Trendelenburg position very readily and the cassette can be locked in place to prevent its shifting about with change in the position of the table.

The Wappler Electric Co. exhibited a water pump for cooling the 30 ma. Coolidge treatment tube. This pump has three serially connected cooling radiators and an automatic cut-off to the primary circuit in the event of failure of circulation in the water circuit. This company also demonstrated a new model semi-portable high frequency electrothermy machine and a small portable Sinusoidal Polarized Current machine.

The Peerless Electromedical Corporation displayed a very compact appearing Multotherm which can be used for diathermy, fulguration, electro-dissolution, desiccation, and high frequency work.

The Standard X-ray Company exhibited the De Luxe Line of X-ray machinery with new features and the double disc method of high tension rectification. The Universal Tube Container represents the company's experience in building a piece of apparatus to safeguard against dangers well known to the profession. It is claimed to incorporate features of protection, such as a safety one-hundred-to-one locking device, safety key lock filter, treatment compression cones, and various centimeter openings, at a calculated distance of fifty centimeters from the tube target to the skin surface.

Finally, the very fine displays and the courtesy of the representatives of The Campbell-Haulenbeck Co., the Patterson Screen Co., the French Screen Co., and the National Radium Products Co. contributed in no small measure to the success and interest displayed in the entire exhibit.

SOLOMON FINEMAN, M.D.

BOOK REVIEW

TEETH AND JAWS, ROENTGENOLOGICALLY CONSIDERED. By HERMAN A. OSGOOD, M.D., Roentgenologist to the Trumbull Hospital; Consultant Roentgenologist to the Gale Memorial Hospital, Haverhill, Mass. Being Vol. V, Annals of Roentgenology, Edited by James T. Case, M.D. Three hundred and fifty-three roentgen-ray studies on 72 full-page plates and 54 diagrammatic line cuts. Paul B. Hoeber, Inc., New York. Price $10.00.

Herein is inclosed in twelve short chapters a discussion that, briefly, sets forth views not in any way at variance with those accepted by the tradition-bound members of the dental and medical professions. The author addresses himself to both. He speaks of the shortcomings of each, though in a very gentle way.

The book is well written. Too many things are said that have been said before. Characteristic as this is of too many publications, one is led to ask if the object of the author is to dress up old ideas in different phraseology.

Dealing with artefacts, the author has done roentgenology a real service, providing, of course, that this volume falls into the hands of those who are led to discount the diagnostic value of the X-ray film. Artefacts and distortions and misinterpretation of white lines and perfectly normal dark areas have misled so many that too much emphasis in regard to these features is seemingly impossible.

The volume is rather more reactionary than progressive. For example, we read that the corner-stone of modern dentistry is the treatment of devitalized teeth. This statement harks back to a period between twenty and twenty-five years ago. The profession to-day has almost left its dead to bury its dead. If prophylaxis is not the corner-stone of the profession to-day, then dentistry has not gone ahead with medicine. However, the author has an idea, as revealed in the volume, that the keeping *in situ* of dead, disorganizing, alienated and incompatible semblances of teeth is the corner-stone of some practices, so let it go at that. Be it known, however, that this feature of practice is nearing low-twelve, especially in the West and Middle West. Few dentists try to encapsulate the apex. They used to, but found that the cap, though not a source of irritation *per se*, did not fit. Yet we find this procedure favorably spoken of in this book.

In the chapter dealing with root-canal treatment one is led to believe that the author never actually tried the operation in the orthodox, back-breaking, eye-straining method extant—I came near saying extinct. To quote, we read that success depends, primarily, on the opening, sterilizing, filling, and sealing the root-canal. Primarily? Yes, verily. Dentists know that these specifications are the alpha and omega of the performance, and all the acts in between.

Furthermore, strange as it may seem, not one of them can be done in multi-rooted teeth and the opening perfectly is permissible only in favorable cases in the twelve anteriors. All dentists who try these things only approximate perfection, and less, in the matter of sterilizing, filling, and sealing, permits infection. It is splitting hairs to say how much infection.

To one who desires to go to this subject with bare hands, so to speak, discussions of the devitalized tooth problem smack somewhat of the involutions of the obvious, or the complicity of simplicity. From the moment the pulp is devitalized the tragedy of Nature trying to exfoliate the thing begins. Why not help Nature?

Seventy-two very fine plates follow the reading matter. From such, diagnoses can be made as far as films will permit. The author demonstrates, beyond a doubt, that interpretable films can be made in the most trying of cases.

C. F. B. STOWELL, D.D.S.

ABSTRACTS OF CURRENT LITERATURE

INDEX TO ABSTRACTS IN THIS ISSUE

BAILEY, PERCIVAL. The Results of Roentgen Therapy on Brain Tumors..... 4

BEER, EDWIN, and HAHN, LEO J. Use of Indwelling Catheter to Induce Passage of Ureteral Stones 8

BOLAFFIO, M. The Calculation of Deep Intensities 85, 86

BOLLIGER, A. (*with* DOUB, H. P., and HARTMAN, F. W.) 59

BRAINE, L. J. CARTER (*with* WATT, W. L.). 89

BROWN, GEORGE E., and ROWNTREE, LEONARD G. Right-sided Carotid Pulsations in Cases of Severe Hypertension..... 52

BULLOCK, F. D., and CURTIS, M. R. A Study of the Reactions of the Tissues of the Rat's Liver to the Larvæ of *Tenia Crassicollis* and the Histogenesis of Cysticercus Sarcoma..... 52

CAMERON, H. C. Lymphangioma of the Leg 92

COATES, IDA (*with* PINEY, A.)..... 86

COLE, H. N. Chronic Roentgen-ray Dermatoses as Seen in the Professional Man... 17

CURTIS, M. R. (*with* BULLOCK, F. D.)..... 52

DOUB, H. P., BOLLIGER, A., and HARTMAN, F. W. Immediate Metabolic Disturbances Following Deep Roentgen-ray Therapy.. 59

EWING, JAMES. The Diagnosis of Cancer.. 88

GOLDEN, ROSS. The Effect of Bronchostenosis upon the Roentgen-ray Shadows in Carcinoma of the Bronchus..... 91

GREENE, D. CROSBY. Treatment of Carcinoma of the Esophagus by Radiation..87, 88

GREENOUGH, ROBERT B. The Treatment of Malignant Diseases with Radium and X-ray—Cancer of Cervix.....86, 87

HAHN, LEO J. (*with* BEER, EDWIN)..... 8

HARTMAN, F. W. (*with* DOUB, H. P., and BOLLIGER, A.) 59

HENDRICKS, C. M. Diagnosis of Tuberculosis 91

KAHN, DALTON. The Treatment of Diphtheria Carriers by Roentgen Radiation.. 70

KNAGGS, R. L. Spondylitis Deformans..91, 92

LEDBETTER, PAUL V., and WHITE, PAUL D. Effect of Pertussis on the Heart.....84, 85

LEHMAN, EDWIN P. Deep-seated Lipomas.. 92

MALTZ, MAXWELL. A New Technique in the Roentgenography of the Nasal Accessory Sinuses 36

MATAS, RUDOLPH. Remarks on the Delayed or Remote Appearance of X-ray Burns after Long Periods of Latency..... 89

MERRILL, A. S. Syphilis of the Stomach, with a Study of Ten Probable Cases.... 85

MOYNIHAN, BERKELEY. Some Aspects of Cholelithiasis 87

NICHOLS, B. H. Some Anomalies of the Kidney 84

PFAHLER, GEORGE E. Electrocoagulation or Desiccation in the Treatment of Keratoses and Malignant Degeneration which Follow Radiodermatitis..... 33

PINEY, A., and COATES, IDA. Metastatic Carcinoma of the Pituitary Gland and Diabetes Insipidus..... 86

PORTER, C. A. The Surgical Treatment of Roentgen-ray Lesions 89, 90

PUTNAM, T. J. (*with* SOSMAN, M. C.)..... 90

ROWNTREE, LEONARD G. (*with* BROWN, GEORGE E.)..... 52

SOSMAN, M. C., and PUTNAM, T. J. Roentgenological Aspects of Brain Tumors—Meningiomas 90

STEPHENSON, F. B. What the Practitioner should Expect in X-ray Diagnosis..... 91

WATT, W. L., and BRAINE, L. J. CARTER. A Study of the Effect of Deep Therapy on the Blood in Leukemia..... 89

WHITE, F. W. The Clinical Importance of Chronic Changes in the Appendix..... 90

WHITE, PAUL D. (*with* LEDBETTER, PAUL V.) 84, 85

Interpretation of anomalies of the kidney.—Anomalies of the kidney may be roughly classified as (*a*) anomalies of number, which include congenital solitary kidneys, congenital atrophy, fused and duplex kidneys; (*b*) anomalies of position, which include ectopic and misplaced kidneys and torsion; and (*c*) anomalies of form, which include polycystic kidneys. Among these groups the first is of especially vital importance to the surgeon.

Congenital solitary kidney is of rare occurrence. This term refers only to the congenital absence of one kidney and should not be applied to a single kidney which remains after an opposite nephrectomy nor to ectopic or fused kidneys. When only one very large kidney is visible on the roentgenogram the possibility that it may be a congenital solitary kidney should be borne in mind. Roentgenograms taken with catheters in position may show either a solitary ureter or that the catheter has passed only a short distance in one ureter and to the pelvis of the kidney in the other.

Congenital atrophy or hypoplasia of the kidney is a result of arrested development, which may have occurred at any stage in the development of the fetus, so that this type of anomalous kidney may show any variation in size from microscopic to nearly normal. Sometimes so-called "rice-grained" stones are found in these congenitally atrophied kidneys. The diagnosis can usually be made from the appearance of the kidney on the roentgen film as compared with the appearance of the kidney on the opposite side, since usually the atrophic kidney is somewhat irregular in shape and smaller than the opposite kidney.

The possibility of the presence of a horseshoe kidney may be first suggested by the kidney outline and its location on the plain kidney films. A horseshoe kidney casts a continuous shadow across the spine, from one lower pole to the other, and the two kidneys appear to assume a vertical position. If a study of the pyelogram discloses torsion in one of the pelves with the calices anterior and extending downward, a horseshoe kidney should be suspected. The discovery of a horseshoe kidney in the presence of some other pathological condition of the kidney, such as tuberculosis, is very important, as the presence of a horseshoe kidney makes nephrectomy impossible and its discovery may often spare the patient an exploratory operation.

The extent of the anomaly, in duplex kidney, varies from what may appear as little more than a long cephalic calyx to complete duplication of the pelvis and ureters. The cephalic calyx is usually the one outlined on the pyelogram, if only one is injected. This calyx presents a rather characteristic dumb-bell shape, extending almost directly upward and slightly outward. In the presence of this type of pelvis the possibility of a duplex kidney should be suspected and further search made for the caudal calyx. If the caudal calyx alone is injected, the appearance of a normal pelvis with an absent cephalic calyx is given, and this again should lead one to suspect a duplex kidney. It should be borne in mind that a tumor of the kidney may obliterate the caudal or cephalic calyx, thereby giving a picture simulating a single pelvis of a duplex kidney.

A true pelvic kidney is a low-lying kidney which derives its blood supply from the iliac artery, so that it has a very short renal artery and pedicle; a low-lying kidney, the position of which is due to arrested ascent or traumatic displacement, derives its blood supply from the aorta. The pelvis of a kidney which has been displaced by trauma is usually normal in outline but lies in a low position and has a kinked ureter. A low-lying kidney, the position of which is the result of arrested development, may have an undeveloped pelvis and be confused with a true ectopic kidney.

The outline of the polycystic kidney is usually irregular, the irregularities corresponding to the cystic areas; pyelography reveals a kidney pelvis markedly deformed by the encroachment of these cysts upon the calices. Occasionally these cysts may rupture and the resultant filling of the cavity with the injected medium may suggest pyonephrosis, but a careful study of the irregular outline of the kidney will usually reveal the true nature of the pathology. The multiple circumscribed areas revealed by the pyelogram may nearly always be regarded as pathognomonic of a polycystic kidney.

J. D. CAMP, M.D.

Some Anomalies of the Kidney. B. H. Nichols. Am. Jour. Roentgenol. and Rad. Ther., Nov., 1924, p. 431.

The heart after pertussis.—1. A review of the literature and the experience of pediatricians of the present day do not yield proof of endocardial or myocardial damage during or after pertussis.

2. Circulatory failure does not seem to occur during pertussis, though the paroxysms of whooping cough undoubtedly do produce a temporary mechanical strain, particularly on the right side of the heart.

3. No evidence of damage to the heart in any case, as a result of whooping cough, could be found in a study of a series of 232 cases seen in the out-patient departments of the Massachusetts General Hospital and the Children's Hospital, Boston, although one child had chronic

endocarditis and one had congenital heart disease before infection.

4. From the writers' study they do not find any evidence that whooping cough has a damaging effect on the heart.

W. W. WASSON, M.D.

Effect of Pertussis on the Heart. Paul V. Ledbetter and Paul D. White. Jour. A. M. A., April 4, 1925, p. 1022.

Stomach lesions of tertiary syphilis.—Syphilis of the stomach is essentially a late tertiary lesion, probably the result of ulceration due to syphilitic endarteritis or degeneration of gummata, with breaking down of cicatricial contraction. There is secondary sclerosis, with deformity. Syphilitic disturbances of the stomach occurring earlier in the course of the infection are not recognized as such and are diagnosed as functional or coincident gastric disease. They are transitory, and disappear under treatment. As surgery is not indicated at that stage and since they are seen only rarely at autopsy, when they may be recognized as syphilitic, little is known of their early pathology.

The symptomatology is very suggestive, resembling ulcer, with the chemical and roentgen findings of cancer. The course begins irregularly and tends to become continuous,—pain and distress immediately after food, not relieved by alkalies, aggravated by food, and relieved by vomiting. Appetite good. A progressive course, with marked loss of weight unaccompanied by the degree of cachexia and weakness seen with cancer. Palpable tumor is uncommon. Anacidity or achylia is the rule. The time of appearance of gastric symptoms after the initial lesion varies. Mills finds the average about ten years. Eusterman, from data in 16 cases, finds an average of eleven years with extremes of one to twenty-eight years.

The diagnosis rests upon a history of infection, positive Wassermann reaction, the demonstration of a gross gastric lesion and cure or definite improvement under antisyphilitic treatment. Absence of history or signs of syphilis and a negative Wassermann reaction do not exclude, nor does a positive reaction prove absolutely the specific nature of the condition.

The roentgen findings are marked gastric deformity tending toward one of two types varying according to the location, extent and duration of the deforming lesion. Either a median deformity of the stomach with contraction, sometimes to a distinct hour-glass shape, or a deforming contraction of the pyloric end extending upward and involving the stomach wall to a variable extent, sometimes extreme and forming a characteristic "water-bottle" shape. In the latter class pyloric obstruction is much less common than might be expected from the extent and location of the lesion. The pylorus, on the contrary, seems incompetent and the contents pass out of the stomach very freely. The duodenal cap, as a result, often appears large, as though dilated. Weak, shallow or absent peristalsis is noted over the involved area. The extent of the infiltration is usually greater than the deformity seen on the roentgenogram would indicate, but the absence of peristalsis or appearance of inflexibility and smoothness or absence of rugæ in the stomach wall as seen on the roentgenoscopic screen suggest more nearly the extent of the involvement. Some improvement in the roentgenogram may be expected after antisyphilitic treatment, the amount depending upon the original extent of the deformity and the amount of fibrous contraction present. In the extreme cases with marked hour-glass or water-bottle contraction, the lumen of the stomach probably is never restored.

At operation or necropsy the stomach shows a marked deformity, with contraction and diminution in size. A diffuse infiltration in the regions shown by roentgen examination is found, somewhat suggesting cancer but lacking the hardness or nodular feel of a malignant tumor. Often the two cannot be differentiated by the surgeon. Anatomically the lesion consists of multiple irregular ulcers of gummatous origin, with thickened submucosa, cicatricial contractions, vascular changes, perivascular infiltration and diffuse infiltration of leukocytes and plasma cells. Demonstration of the specific organisms in the tissues would be the final proof, but must not be expected.

J. D. CAMP, M.D.

Syphilis of the Stomach, with a Study of Ten Probable Cases. A. S. Merrill. Am. Jour. Roentgenol. and Rad. Ther., Nov., 1924, p. 444.

Deep intensities.—The author gives further details on the use of his "Italian formula," previously published (in "Atti del III Congresso Ital. di Radiologia Med.," 1921), for the calculation of deep intensities. The formula reads:

$$I_n = I_0 \frac{d^2}{d_n^2} \left(1 - \frac{1}{x}\right)^n,$$

whereby I_n and I_0 represent the intensities at the depth n and at the surface, d_n and d the respective focal skin distances and $\frac{1}{x}$ the loss of radiation by absorption and scattering. By comparing the calculated deep intensities with his own measured deep intensities (by means of a modified Reiniger Iontoquantimeter), as well as with those measured by others, the author shows that his

formula, which really represents only the well known square and exponential laws, can be used with a certain approximation for practical purposes.

OTTO GLASSER, Ph.D.

The Calculation of Deep Intensities. M. Bolaffio. Strahlentherapie, XVIII, 3, 1924, p. 595.

Diabetes insipidus.—A case of secondary carcinoma of the pituitary gland is recorded and evidence in favor of the conception of causation of diabetes insipidus by secretion of the pars anterior is adduced.

W. W. WASSON, M.D.

Metastatic Carcinoma of the Pituitary Gland and Diabetes Insipidus. A. Piney and Ida Coates. Jour. Path. and Bacteriol. (Gt. Brit.), April, 1924, p. 211.

Surgery and radiation.—The following is the report of a committee of the American College of Surgeons on the study of the relative merits of the treatment of cancer of the cervix by radium, X-ray and surgery. Twelve hundred ten case records were selected for study from 22 hospitals, and the most rigorous tests applied to the material in question before it was accepted for study. Results were for the years 1914 to 1918, and since the technic of radiation application has so much improved since this time, no statement of value for the present-day technic can be made. This series includes no case in which 200 K.V. X-ray therapy was used.

688 cases (primary) were divided into four groups[1]

		Cures 3 yrs.	Per cent
Class 1-A—Early favorable	123	35	28
Class 1-B—Borderline	120	22	18
Class 1-C—Broad ligament involved	310	24	7
Class 1-D—Advanced cases	135	2	1
	688	83	8
Classes 2 and 3—Recurrent after hysterectomy	123	9	17
Class 4—Cervical stump	18	2	11
Total	829	94	11

For this series of cases the following conclusions seem to be correct: It is to be noted that the percentage of cures by hysterectomy alone (26 per cent) is the same as the cures where pre-operative and post-operative radium is employed. The operative mortality of 16 per cent in cyst is also to be noted. Not one of the 52 cases in which cautery was used resulted in cure. Pre-operative use of radium in 40 cases, followed by hysterectomy, gave approximately the same percentage of cures (25 per cent) as when radium was used in post-operative treatment (27 per cent). It is to be noted that the 40 cases of pre-operative radiation do not appear to increase the hazard of operation to a greater extent, as it was found to be only 4 per cent. In early favorable cases hysterectomy without radiation gave 14 cures in 41 cases (34 per cent). There were eight operative fatalities, a mortality of 19 per cent, and the use of radium either before or after operation does not appear to increase the percentage of cures. Radium alone gave 15 per cent and radium combined with X-ray gave six cures, or 42 per cent. The numbers are small. Roughly stated, in early favorable cases hysterectomy gives one chance in three of cure, with an operative mortality of one in five, where radium with or without the cautery gives a chance of one cure in four without mortality.

In borderline cases, hysterectomy alone gave 25 per cent cure, in 16 cases; operative mortality 31 per cent. Hysterectomy with radiation, 33 per cent cured in 15 cases. Radium alone, only 10 per cent of cures. Radium with palliative operation, same as hysterectomy with or without radium. It would appear that in the borderline cases the prospect of cure by hysterectomy is less; the use of radium before operation may improve the outlook, and the operative mortality is higher than in the early favorable group. Combining early favorable and borderline cases, roughly stated, hysterectomy without radium cures one in three cases, with operative mortality of one in four. Radium with a palliative operation cures one in three and radium without palliative operation cures one in five.

In cases with broad infiltrations, radium alone cured twelve cases and radium with palliative operation cured seven. The number treated was large and the percentage was small.

Advanced and supposed hopeless cases: Of 135 cases treated, none were cured by operation, one by radium alone, and one by radium and cautery.

In the early group, radium gave a slightly longer average life.

Rectovaginal and vesicovaginal fistulas occur spontaneously. The danger of fistula formation is increased by any method of treatment, with hysterectomy 5.5 per cent, cautery alone 5.6 per cent, radium alone 5.7 per cent, cautery and radium 7 per cent in advanced cases. The value of radium as a palliative agent is generally ad-

[1]Eighteen cases of cancer of the cervix which developed after supravaginal hysterectomy for fibroid were not included.

mitted. That life is materially prolonged is hard to prove.

Smallest doses of radium used in the cured cases, as follows: Class A, 1,700 millicurie hours; Class B, 1,725 millicurie hours; Class C, 2,200 millicurie hours.

The largest dose in a cured case was 1,600 millicurie hours, given in twenty-nine treatments.

57 "cured" primary cases 5,004 millicurie hours

1 A Class	16 cases	3,354 millicurie hours
1 B Class	18 cases	5,896 millicurie hours
1 C Class	23 cases	5,455 millicurie hours

It is of interest to note that in all cases of hysterectomy which resulted in a "cure," in only two was evidence presented that the disease had extended beyond the uterus itself, and in these two cases the pelvic lymph nodes were not diseased, but cancer was found by microscopical examination in the paramesial tissue adjacent to the cervix.

L. R. SANTE, M.D.

The Treatment of Malignant Diseases with Radium and X-ray—Cancer of Cervix. Robert B. Greenough. Surg., Gynec. and Obst., July, 1924, p. 18.

Cholelithiasis.—Moynihan is of the opinion that cholecystitis precedes cholelithiasis in all cases except those in which the solitary cholesterin stone is found. He further states that it may be taken as indisputable that a gall bladder which is clearly visible on ordinary radiologic examination, without the aid of pneumoperitoneum, is pathologic.[1]

In the absence of gallstones, the following are the signs which justify cholecystectomy, because they indicate a diseased condition of the gall bladder: (1) when it has lost its blue color or its sheen; (2) when it has lost its suppleness and its walls are thickened by fibrous tissue, or by deposit of fat, especially along the lines of the vessels; (3) when the cystic gland is definitely enlarged and changed in structure; (4) when adhesions have been contracted to the parts around, especially to the duodenum, or the stomach; (5) when the cystic duct is thickened and the pelvis of the gall bladder has settled in a mass of adhesions, firmly down upon the common duct.

SOLOMON FINEMAN, M.D.

Some Aspects of Cholelithiasis. Berkeley Moynihan. Brit. Med. Jour., Feb. 28, 1925, p. 393.

Carcinoma of the esophagus.—Observations based on seventeen cases treated at the Massachusetts General Hospital during the past two years.

When the lesion shows the gross appearance of carcinoma, radium emanation seeds are inserted into the growth under direct vision. This method of intra-esophageal radiation, while it has not cured any cases, has been most effective and satisfactory. In cases where the growth is situated just above the introitus of the esophagus occasional apparent cures have resulted. When the tumor is situated within the esophagus its inaccessibility is a great handicap to the effectiveness of this method. With the aid of the esophagoscope the upper portion of the growth can be observed, but it is usually impossible to determine the limits of its extension in other directions. The most that can be hoped for in the way of accomplishment is the destruction of that part of the tumor which lies within and close to the esophageal lumen, and high voltage roentgen rays are used for the treatment of the rest.

Ether anesthesia is used for the insertion of the seeds because it enables one to use greater deliberation and accuracy in the insertion. The immediate reaction to this instrumentation and treatment, if they are carried out with care and avoidance of trauma, is slight, and the patients are usually able to leave the hospital the following day. Within a few days a decided improvement in swallowing is usually noted, which is doubtless to be attributed to the bougienage.

The deep roentgen treatments in most cases are given in a series of three or four exposures extending over a period of about a week, beginning a few days after the radium treatment. In about eight weeks the roentgen treatment is repeated. At irregular intervals of about two months the direct examination of the esophagus and radium treatment has also been repeated in the author's cases, but he believes that the most effective radium treatment is the first, and of late has relied on the deep roentgen therapy after the initial radium treatment.

The changes observed at esophagoscopic examinations subsequent to treatment have varied greatly in different cases. In some, a marked regression of the tumor was demonstrable; in others the swelling incident to the

[1] *Abstractor's note.*—In a recent editorial, published in the *American Journal of Roentgenology and Radium Therapy* (February, 1925), Carman writes: "With the accepted supertechnic and superinterpretation it became possible occasionally to reveal the shadow of the gall bladder itself, although identification of the shadow often depended too greatly on the patience, skill, and courage of the examiner. It was assumed that any gall bladder which cast a shadow was diseased, and simple roentgenography received new impetus. However, many markedly diseased gall bladders were still invisible. Finally it was established that under favorable circumstances a normal gall bladder could be depicted on the film. While a very large or very dense shadow of the gall bladder could reasonably be regarded as indicating disease, it was hazardous to attach diagnostic significance to a shadow of normal size and faint density."

radium reaction more or less obscured the growth. This swelling may be enough to increase the obstruction and require gastrostomy, if this has not already been done. Early gastrostomy is recommended in all cases, as this results in marked improvement in general condition and in maintenance of bodily weight and strength. With rest and cleanliness of the esophagus thus induced, and the nutrition maintained, more favorable results from radiation should be expected.

Of the seventeen cases treated, nine have died or are untraced and eight are still under observation.

J. D. CAMP, M.D.

Treatment of Carcinoma of the Esophagus by Radiation. D. Crosby Greene. Am. Jour. Roentgenol. and Rad. Ther., Nov., 1924, p. 471.

Malignancies.—The introduction of radiation treatment has emphasized the importance of the finer diagnosis of tumors, for without knowledge of the structure and natural course of the disease, intelligent conduct of the treatment of malignant tumors—either by the radiologist or by the surgeon—is seriously handicapped. For example, cancer of the stomach occurs in the form of linitis plastica that may run a slow course of fifteen years or more, and also as a very aggressive process that kills in three or four months. The attitude of the physician must be radically altered to meet the different indications of two such widely varying conditions.

Different forms of carcinoma or sarcoma of the same organ may vary so greatly in their clinical features as to constitute them different diseases. Hence, if the laboratory is to furnish serviceable reports to the clinical departments, the pathologist must have a wide acquaintance with the disease and a clear discernment of the particular phase with which he is dealing. This implies that the pathologist must serve as a consultant, acquainted with the clinical aspects of the disease. In other words, there must be cordial co-operation between the laboratory and the clinic.

Many errors in diagnosis would be avoided if the pathologist insisted on obtaining clinical data with every specimen. Haste in the demand for reports involves faulty fixation of tissue, resort to the freezing microtome, and often snap judgment. Much value attaches to the frozen method, since it reveals the nature of many tumors, but usually only those which an experienced pathologist can recognize by gross examination. Not a few alterations in structure may be difficult to recognize in frozen sections. In fact, no aid from the frozen sections can replace the surgeon's capacity of recognizing cancer by sight and touch. Certain features of tumor tissue and structures infiltrated by tumor cells are readily recognizable by sight and touch. Induration is the most uniform sign of carcinoma that excites connective tissue growth, but many cellular cancers are soft and opaque.

Roentgenography has greatly enlarged the opportunities for the study of the gross anatomy of tumors, and should reduce the indications for biopsy and exploratory operation. The pathologist should become expert in the interpretation of roentgenographic data. For example, without the control of the roentgenogram, the diagnosis of bone tumors labors under severe handicaps.

Biopsy renders great service in the recognition of tumors but should be practised with extreme caution. The removal of a small carefully selected portion of an accessible tumor seldom produces harm, but cutting through the skin to excise a portion of a breast tumor should generally be discountenanced; it is better to remove the whole tumor and to proceed immediately with the treatment indicated by the pathologic findings. Incision of encapsulated malignant tumors growing under pressure is nearly always harmful, and may be disastrous. Incision into bone tumors may stimulate growth by release of pressure or may lead to infection or to uncontrollable hemorrhage; often the portion of tissue fails to yield a satisfactory or correct conclusion.

The results of radiation therapy may reveal interesting diagnostic data. For example, giant-cell tumors of bone respond to external radiation by preliminary swelling and subsequent regression, whereas most osteogenic sarcomas exhibit no such changes or respond very slowly. Lymphosarcoma often melts down rapidly with little fibrosis under radiation, while Hodgkin's granuloma is more resistant and generally leaves cicatricial masses.

From the study of stained sections, the pathologist is not content merely to determine the general class of the tumor. In nearly all glandular organs there are many grades of adenoma, adenocarcinoma, and true fully developed carcinoma, with corresponding variations in the clinical course. To point out all of this, the pathologist often needs the gross material and always the clinical data. In short, the pathologist endeavors to render a clinical diagnosis and not merely a histologic report.

On prognostic points, important data may be obtained from a careful study of the gross specimen and of many sections from selected areas. Complete encapsulation—especially in bone sarcoma—is a good prognostic sign, whereas rupture of a capsule often changes a comparatively good into a very unfavorable prognosis.

JOSEPH MUIR, M.D.

The Diagnosis of Cancer. James Ewing. Jour. A. M. A., Jan. 3, 1925, p. 1.

Treatment of X-ray lesions.—The author reports two cases illustrating the latent or long-delayed effect of radiotherapy. In these the injurious and destructive lesions caused by the rays on the skin and subdermal tissues did not appear until three or four years after the roentgen therapy had been discontinued and the patients had recovered from its immediate effect.

The first case, a young woman suffering from exophthalmic goiter, had received a systematic course of radiation, generated by an old-fashioned static machine and hard tube without filtration. Treatments not quite approaching an erythema were given at intervals for three years. Some skin atrophy and telangiectasis developed. Four years later the skin of the neck became thickened, infiltrated and patches of gangrenous dermatitis appeared. These areas coalesced and spread over the entire area of radiation, from the chin to the midsternum and upper surface of the mammæ. An attempt to promote healing by pin grafts failed, and ulceration continued to be intractable. Two years later healing followed an excision of the entire area and the placing of grafts.

The second case, a woman aged fifty-three, had received prophylactic postoperative unscreened roentgenotherapy for carcinoma of the breast, over a period of three years. The patient had been well for three years following the last radiation, when a gangrenous dermatitis appeared in patches over the radiated area. These patches coalesced, leaving a large area of ulceration, which continued with remissions and exacerbations until death nine years later. The ulcerated areas were rebellious to all forms of treatment and the pain so severe that narcotics had to be given freely. As the ulcer contracted its edges became callous, horny in places, under which an epidermoid carcinoma developed.

In the experience of the author, once an X-ray burn has advanced to ulceration, practically nothing will accomplish its cure but a total excision of the entire diseased area, provided this can be covered by healthy, well-nourished flaps or by grafts applied to a perfectly healthy base. For the relief of pain the author has obtained the best results by the use of "Fischer's fluid" or "incitamin," which gives immediate relief and also clears the ulcers of sloughs.

J. D. CAMP, M.D.

Remarks on the Delayed or Remote Appearance of X-ray Burns after Long Periods of Latency. Rudolph Matas. Am. Jour. Roentgenol. and Rad. Ther., Jan., 1925, p. 37.

Leukemia therapy.—This is a report of the result of treatment of eight cases of myelogenous and lymphatic leukemia with rays generated at 210,000 volts, filtered through 0.5 mm. of zinc and 3 mm. of aluminum, and applied at a distance of 23 cm. The authors find that patients who have failed to respond to a prolonged course of treatment by X-rays of the longer wave length, are still susceptible to dep therapy, with a resulting clinical improvement.

The writers' theory is, that the leukocytes that survive the bombardment of the rays are the fittest and the strongest, as the weaker, younger and more immature leukocytes are the first to be destroyed. It is their belief that following irradiation with the short wave length ray, and after the tissues have returned to a more or less normal condition, the newly formed leukocytes have acquired a definite new characteristic; they are more resistant to the rays and might be called "gamma leukocytes." It is probable that the extraordinary feeling of well-being that so frequently follows deep therapy radiations is due to the presence of these "gamma leukocytes," as well as to the accompanying rise of the hemoglobin and red blood corpuscles, which may likewise have acquired the "gamma" quality. In the eight cases reported the health of the patients steadily improved and in the uncomplicated cases the patients were soon back to full-time work.

SOLOMON FINEMAN, M.D.

A Study of the Effect of Deep Therapy on the Blood in Leukemia. W. L. Watt and L. J. Carter Braine. Lancet, Jan. 3, 1925, p. 6.

Roentgen-ray lesions.—The author has classified all roentgen-ray lesions in three main groups: Group I, Lesions resulting from a single masisve do se, intentional or otherwise, or a few exposures at short intervals; Group II, Cases with chronic diseases, pulmonary tuberculosis, lupus, psoriasis, eczema, and particularly the treatment of malignant disease, with many exposures over a long period; Group III, Professional roentgenologists, many of them physicians, who have used roentgen rays from the beginning, before its dangers and proper precautions were known.

The author emphasizes the common occurrence of a so-called latent period, between the last exposure and the development of ulceration or yellow gangrene. Usually this interval is not more than a few months, but in several cases has been prolonged for three or four years after the last treatment. The anemic gangrene which develops in these cases is peculiar in that no definite line of demarcation forms as in ordinary anemic gangrene, but there seems to be a sufficient vascularity to keep the part from dying outright, while there is inadequate reaction on

the part of the surrounding tissue to cast off the slough.

In the treatment of the first group of lesions all irritants, caustics and even all antiseptics are interdicted unless there is well-marked infection. Protection from the air is essential on account of the pain and is best obtained by a neutral powder, such as stearate of zinc covered by an occlusive dressing with elevation and immobilization of the part. Where many more or less acute lesions exist on the hands or face, such palliative treatment may be tried for a certain period, but in other parts of the body, early adequate excision is recommended, not only because it brings immediate relief from the excruciating pain, but because it is the surest, quickest and most permanent cure. When excision would involve important structures, as much of the affected tissue should be cut away as one dares, and the remainder of the wound must be left to granulate if it will. The tendency is to be too conservative and the lesions are more extensive than at first appear. Owing to the danger of sloughing in the flap from the widespread endarteritis, sliding flaps or plastic operations are not recommended. Recurrent nail infections in the involved area demand complete removal of the nail and extirpation of the nail bed. Chronic fissures are best cured by skin grafting. Keratoses, particularly if ulceration has ever occurred, should be destroyed.

When considering the chronic intermittent or persistent ulceration on the hands of roentgen-ray workers in which there is a reasonable suspicion of malignancy, surgical treatment is the method of choice.

J. D. CAMP, M.D.

The Surgical Treatment of Roentgen-ray Lesions. C. A. Porter. Am. Jour. Roentgenol. and Rad. Ther., Jan., 1925, p. 31.

The appendix.—The direct signs of chronic changes in the appendix are tenderness, fixation, kinking, changes in shape and position, lack of filling, slow emptying, beading and adhesions.

The indirect signs are pyloric spasm, gastric residues and ileal stasis. Most of the signs are suggestive rather than definite, and several, the more the better, are needed for diagnosis.

Tenderness is the best sign of pathology. The patient rarely needs operation if there is no tenderness when the appendix is moved under the palpating finger or spoon. Caution is necessary in ptosis cases as the heavy, full, atonic cecum is often tender. If a tender low cecum is found with no visible appendix, it should not be concluded that a tender retrocecal appendix is present.

There is considerable evidence that the appendix may fill and empty more than once during the usual examination, and it is not safe to diagnose an obliterated appendix simply because it is not seen. Segmentation or beading has commonly been called a sign of disease. It is found in about one-third of the normal cases and has no value as a sign of pathology. Such a condition is never found at operation or autopsy.

Fixation is important if one part, such as the tip or median part, is fixed, with kinking and deformity. There is considerable normal variation in the mobility of the appendix; its mesentery, like that of the cecum, is variable, so that some appendices are very free and others quite fixed.

In a group of cases operated on, different roentgen-ray signs were found. The most important were tenderness, constant changes in shape, fixation and abnormal position. The less important were abnormal filling and emptying, with ileal residues; beading was considered normal. Diagnosis should be made only in connection with the clinical history.

J. D. CAMP, M.D.

The Clinical Importance of Chronic Changes in the Appendix. F. W. White. Am. Jour. Roentgenol. and Rad. Ther., Jan., 1925, p. 12.

Meningiomas. — The roentgenological findings in a group of 95 verified intracranial meningiomas are reviewed. Of these, 47 (or 49.3 per cent) showed recognizable changes characteristic of the tumor. In the films of 11 cases of meningioma of the spinal canal, no definite changes could be seen.

The bony changes which are considered characteristic are: (1) Erosion and vascularity; (2) Osteoma formation; (3) Spicule formation; (4) Diffuse thickening, and (5) Enlargement of the meningeal channels. A sixth manifestation is the calcification of the tumor itself, which is probably a regressive change. These changes are most frequently and clearly seen in meningiomas of the vault. Tumors above the sella are apt to cause a non-specific distortion and destruction of the clinoids. Tumors of the base are often accompanied by a diffuse thickening of the floor of the skull. Those arising from the falx, from about the sella, or from the sinuses of the posterior fossa are least likely to give any indication of their presence.

A brief review of the comparative incidence, pathology, and classification of meningiomas is also given.

J. D. CAMP, M.D.

Roentgenological Aspects of Brain Tumors—Meningiomas. M. C. Sosman and T. J. Putnam. Am. Jour. Roentgenol. and Rad. Ther., Jan., 1925, p. 1.

Bronchial carcinoma. — A study of cases suggests that as far as its physical effect is concerned, bronchial carcinoma may be considered as developing in two stages: (1) stage of invasion, and (2) stage of bronchostenosis, which is characterized by bronchiestasis, infection, atelectasis, and pleural thickening, with or without fluid.

The hazy, ill-defined shadow about the hilus during the stage of invasion may be replaced, as the effects of bronchostenosis begin to manifest themselves, by a dense homogeneous shadow covering the area of one or more lobes, sometimes accompanied by displacement of the heart and trachea to the affected side. Such massive shadows are due to atelectasis of the corresponding lobes, with associated bronchial and pleural changes, and not to the tumor itself. Hence, it is evident that they are not characteristic of bronchial carcinoma but may be produced by any process which occludes a bronchus.

J. D. CAMP, M.D.

The Effect of Bronchostenosis upon the Roentgen-ray Shadows in Carcinoma of the Bronchus. Ross Golden. Am. Jour. Roentgenol. and Rad. Ther., Jan., 1925, p. 21.

"Don'ts" for general practitioner.—This paper is a discussion of the limitations and possibilities of X-ray in the examination of various portions of the body, written for the information of the general practitioner. The conditions which can be examined for, with reasonable expectation of assistance in diagnosis, are outlined with reference to the following anatomical regions: the head, abdomen, pelvis, chest, bones, digestive tract, urinary tract, eye. A series of "don'ts" are given, such as "don't expect cartilage, ruptured ligaments and nerves to show"; "don't expect a differentiation between empyema and hydrothorax"; "don't expect gall-bladder pathology to be diagnosed always"; "don't expect to show pregnancy under three months"; "don't be afraid of X-ray burns in diagnostic work," etc.

W. W. WATKINS, M.D.

What the Practitioner should Expect in X-ray Diagnosis. F. B. Stephenson. Colo. Med., Aug., 1924, p. 222.

Early diagnosis of tuberculosis.—The most important thing in tuberculosis is early diagnosis, the control and prevention being absolutely dependent on early diagnosis. In examination, the stethoscope is valuable, but often leads to trouble in certain types of cases. In suspected tuberculosis of infancy and childhood, the X-ray picture is important, because up to five years, the lung fields are fairly clean in the healthy child. During the school age, the added shadows of past respiratory conditions make the X-ray of less value in early cases.

It must not be forgotten that a healed tuberculosis often presents latent râles which mean nothing as regards clinical tuberculosis.

W. W. WATKINS, M.D.

Diagnosis of Tuberculosis. C. M. Hendricks. Southwestern Med., June, 1924, p. 261.

Three types of spondylitis deformans.—Spondylitis deformans is defined as a painful stiffnes sof the spine ending in complete rigidity, combined in nearly all instances with a kyphotic curvature producing a variable degree of deformity. Three types of the disease are described: (1) Ossification of the spinal ligaments, more or less general—spondylitis ossificans ligamentosa; (2) Upper dorsal curvature and atrophy of the intervertebral discs which depends on impaired muscular power—spondylitis muscularis; (3) Changes of an osteo-arthritic—spondylitis osteo-arthritica.

In Type 1 every gradation is met with in the spine, from ossification of the anterior common ligament alone to a similar change in all the spinal ligaments. Often when the spine is affected other joints, such as those of the limbs, shoulders, and jaws, are attacked. In the spine ankylosis is due to ligament calcification. In other joints ligaments do not ossify, but opposing articulating surfaces become united by fibrous tissue and eventually by bone. Ossification of the anterior common ligament is obviously only a stage, and probably an early one, in a morbid process which is prone to involve other ligaments and to merge into the pronounced form of the disease. The spaces left between the ankylosed verterbræ by the removal of the intervertebral substances appear almost linear, suggestive of atrophic fibrocartilages, but more commonly appear to have been occupied by discs of normal thickness.

In the pathogenesis of the generalized type, the toxic factor is probably supreme, but in ossification of the anterior common ligament alone traumatism in the form of ligamentous strain is probably more important than toxins.

In spondylitis mustularis, the disease is usually limited to the upper part of the spine and the joints of the vertebræ are not involved. The most important element in its causation is the feeble tone of the muscles. The atrophic changes that occur in the intervertebral discs are secondary to the muscular failure and are caused by the increase of pressure at certain points consequent upon the forward bending of the spine. Other predisposing causes are trauma and heredity. The spinal changes associated

with old age may be regarded as a variation of spondylitis muscularis.

The morbid anatomy shows a kyphotic curve in the upper mid-dorsal region arising primarily from muscular weakness, and pressure atrophy of the discs included in the curve, more particularly the anterior parts. This is followed by fusion of the anterior parts of the articulating surfaces of the bodies, when, owing to the destruction of the intervening portions of the discs, the bony surfaces of the adjacent vertebræ are brought into contact. In the senile form atrophy of the discs is not limited to the region of the curve but extends throughout the spine.

Osteo-arthritis of the spine resembles the same disease in the joints of the extremities, but it presents certain remarkable differences. Those characteristic signs—disintegration and removal of articular and inter-articular cartilages and the formation of marginal osteophytes—are as pronounced in the spinal joints as elsewhere. On the other hand, an absence of eburnation and some tendency to ankylosis are peculiar to the spinal affection. A study of specimens showed that fusion of the anterior surfaces of the bodies and of the articular processes was unusual, and when bony ankylosis was present it was commonly due to fusion of the osteophytic lipping of adjacent vertebræ, but more often, even in advanced cases, the line of contact persisted without fusion. Fusion of the vertebral bodies did occasionally occur, but it was under circumstances in which pressure and probably complete immobility were determining factors.

J. D. CAMP, M.D.

Spondylitis Deformans. R. L. Knaggs. Brit. Jour. Surg., 1925, XII, No. 47, p. 524.

Lipomas.—Intramuscular lipoma is exceedingly rare, less than forty cases having been recorded, while submuscular and intermuscular lipoma occurs somewhat more frequently. Pichler believes that intramuscular lipoma is more frequent than it is ordinarily considered to be. We are not considering, it is to be remembered, the impure types of lipoma, such as the lipomyxoma, which may be malignant and invade the musculature.

W. W. WASSON, M.D.

Deep-seated Lipomas. Edwin P. Lehman. Jour. Am. Med. Assn., April 4, 1925, p. 1032.

Lymphangioma.—Boy, aged six years, had a swelling of the leg since infancy, which grew rapidly after the sixth month. At eighteen months the affected leg below the knee was three times as large as the other. Surgical attempts t oreduce the tumor failed. X-ray examination showed great thickening of the periosteum. The child walked at the third year, the tumor decreasing in size and causing little inconvenience.

B. C. CUSHWAY, M.D.

Lymphangioma of the Leg. (9) Demonstration of Cases at Guy's Hospital. H. C. Cameron. Brit. Jour. Child. Dis., March, 1925, p. 52.

X-RAY LABORATORY FOR SALE—Because owner is unable to give necessary personal attention to it there is offered for sale a well equipped X-ray laboratory located in a growing Illinois city with a population of 35,000 people. Equipment consists of one large size standard machine, one Coolidge tube, two gas tubes, dark room and scope room. Two medical doctors and one dentist on the same floor. Best location in the city. Will sell location and outfit for $600.00 on reasonable terms. This is an excellent opportunity. For full particulars address A-10, care RADIOLOGY.